Marine Review
February, 1928

Panama Pacific Liner California—Sailed Jan. 28 on Maiden Voyage—New York to California

California with Electric Drive Is Largest American Built Liner

By Herbert R. Simonds

IN THE great march of shipping progress certain events stand out clearly. The first steamboat marked one epoch. The first propeller drive was another, and now we have the first large electric liner. The CALIFORNIA, a vessel of 22,000 gross tons, fresh from the shipyard, has just entered active intercoastal service. Although using steam as a primary source of power to generate electricity, the CALIFORNIA has no engines in the ordinary sense. Two small steam turbines drive two high-speed electric generators which together develop 17,000 horsepower. This energy is transmitted by cables to two large electric motors, each directly connected to a propeller shaft. The actual driving force therefore is electricity and this, together with the fact that electricity drives nearly all the auxiliary equipment, justifies the term "electric liner." Credit for the idea of employing an electrically driven vessel in merchant service goes to Capt. Roger Williams. Capt. Williams became acquainted with electric drives in the navy, where this type of propulsive power has been successfully employed for years.

The original plan for the liner was conceived and laid out by Ernest H. Rigg, and much credit for many of the overall features must go to him. While the plans were in progress, the shipyard changed owners, the International Mercantile Marine Co. disposing of its interest. At this time the contract for completing the plans and for building the vessel was let to the Newport News Shipbuilding & Dry Dock Co., Newport News, Va.

In the same way that it is difficult to rebuild an old house, it is always a big job to take over unfinished plans of a boat and carry these on to a point where actual construction may be started. The size and unusual character of the CALIFORNIA made this particular task doubly difficult, and the entire force of the Newport News Shipbuilding & Dry Dock Co. is to be congratulated on the efficiency with which the work was carried on. The vessel is the largest merchant ship ever built in this country, and perhaps this fact contributed something to the enthusiasm which pervaded the entire shipbuilding personnel. Particular credit must go to Homer L. Ferguson, who is president and general manager of the shipbuilding company, and to H. F. Norton,

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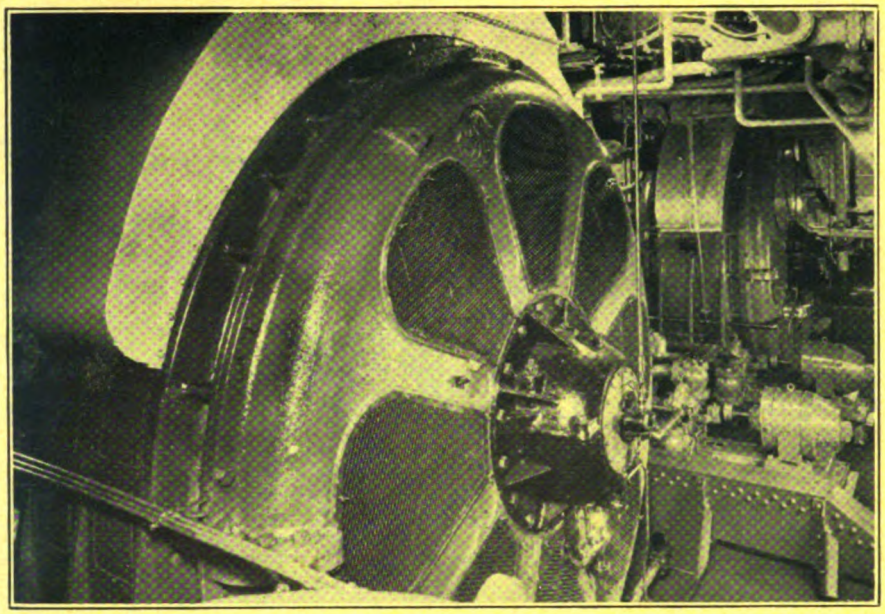


S.S. California—One of the Main Propulsion Motors—Starboard Side

naval architect, and William A. MacDowell, chief draftsman. The CALIFORNIA was launched on Oct. 1, 1927. The dock trial was held early in December and the sea trial on Jan. 7. On Jan. 13 she left the yard at Newport News and proceeded to New York, and toward the end of January sailed on her maiden voyage from New York to the Pacific coast. The CALIFORNIA is in a sense an offspring of the Panama canal. Without the canal there would be no CALIFORNIA and, of course, no Panama Pacific line. The International Mercantile Marine Co., which operates this line, will build, all told, three vessels of the CALIFORNIA type for coast to coast trade. The keel of a sister ship has already been laid at Newport News.

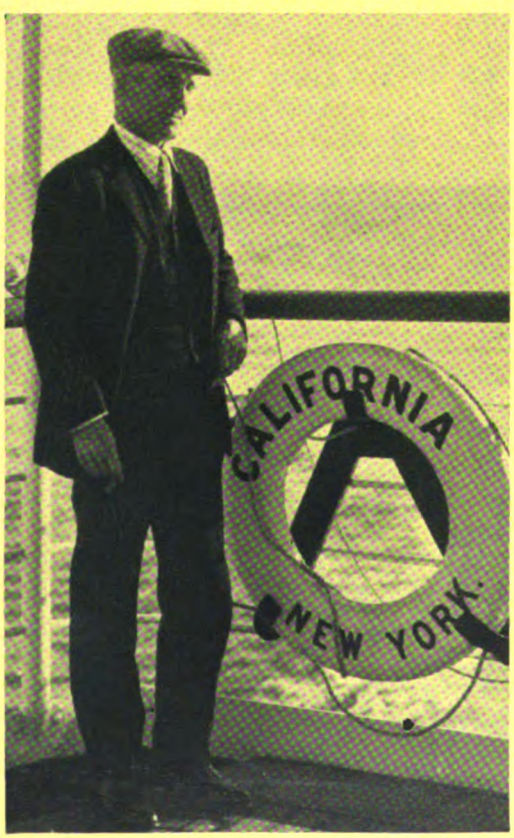
Many details of the design of the CALIFORNIA have been arranged to meet the requirements of semi-tropical waters, but to all intents and purposes the new ship is an ocean liner of the highest type and well adapted to meet any service on the high seas.

Economical Operation Is Necessary

The modern tendency in shipping operations tends more and more toward reducing cost. Production in the case of shipping is transportation of passengers and freight. The CALIFORNIA is essentially an American vessel. She fulfills the modern American demand for comfort and the artistic in traveling accommodations and at the same time has a far more extensive and efficient mechanical equipment than has heretofore been the practice in merchant marine construction.

Before giving a detailed description of the vessel and its American planned equipment, it may be well to list a few of the outstanding dimensions and particulars:

Homer L. Ferguson--Shipbuilder



WHEN the responsibility of the job of carrying through the plans and construction of the largest American built merchant vessel fell to Homer L. Ferguson, head of the Newport News Shipbuilding & Dry Dock Co., Newport News, Va., it landed on a real shipbuilder, and the enthusiasm apparent throughout the entire personnel of this organization is due in a large part to the inspiration, determination and energy of Mr. Ferguson.

Starting his naval career as assistant in the construction corps of the United States navy, Mr. Ferguson progressed through many navy appointments. He was at one time superintendent of extensive dock construction at Baltimore. Later, he directed naval work at Portland, Ore., and at Bremerton, Wash. In 1904 he was put in charge of supervising the construction of vessels for the navy at Bath Iron Works, Bath, Me., and in 1905 he was transferred to Newport News, Va.

Following this he was with the bureau of construction and repair, at Washington and resigned that position to become associated with the Newport News Shipbuilding & Dry Dock Co. With this company he advanced rapidly through various capacities, becoming president and general manager in 1915, since which time he has been the active head of this successful company. A man of strong personality and an exceptional amount of enthusiasm, he has added one distinction to another in the marine construction field. It was under his direction that the big job of reconditioning the LEVIATHAN was carried through in remarkably short time and the recent completion of the CALIFORNIA adds a further and no less brilliant chapter to his record.

He was born in Waynesville, N. C., March 6, 1873, and graduated from the United States naval academy in 1892, after which he went to England to attend the naval college at Greenwich, from which institution he was graduated in 1895.

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General Particulars S.S. California

Length over all, feet, inches	601—0
Length on water line, feet, inches	595—0
Length between perpendiculars, feet, inches	574—0
Beam molded, feet, inches	80—0
Beam at promenade deck, feet, inches	77—0
Depth to shelter deck, feet, inches	52—0
Depth to upper deck at side, feet, inches	42—6
Load draft to bottom of bar keel feet, inches	32—3
Camber, all decks in 80 feet	0—6
Gross tonnage	22,000
Displacement, tons	30,250
Dead weight carrying capacity, tons	15,300
Capacity of fuel oil compartment, tons	5,100
Maximum continuous shaft horsepower	17,000
Normal shaft horsepower	13,500
Normal speed, service condition, knots	16½
Speed on three hour test, knots	18.99

Two General Electric steam turbines each capable of developing 8500 horsepower, direct connected to alternating current generators.

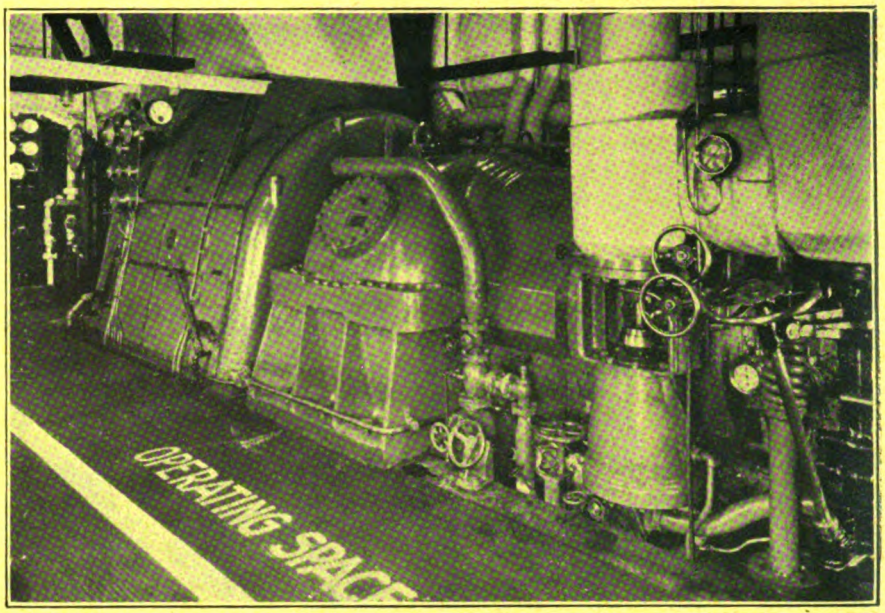
Two main propulsion motors, one directly connected to each propeller shaft.

Twelve Babcock & Wilcox water tube boilers.

Two propellers of three-blade type, 18 feet in diameter.

Accommodations on S.S. California

First-class passengers, 386; tourist class passengers, 363; officers and crew, 380. All staterooms for both classes are outside rooms, reached by inside passageway without exposure to the weather. Every stateroom has a lavatory with hot and cold running water. The decorative scheme and recreation facilities are distinctive and will be described in detail later.



S.S. California—Port Side Propulsion Turbine Generator

The sea trial of the electric ship CALIFORNIA was held Jan. 7. The vessel left the dock of the Newport News Shipbuilding & Drydock Co., Newport News, Va., early in the morning and proceeded to Cape Henry. From there she ran over a 16-mile course south to False Cape and back, a total of 32 miles. On the first trip one generator was operated, turning the screws at 77 revolutions a minute, and under this condition an average speed of 14 knots was developed. On the second trip around the course both generators were operated, turning the screws at 120 revolutions a minute and developing an average speed of 18 knots. On Jan.

P. A. S. Franklin--Steamship Owner

FROM a minor position with the Atlantic Transport line to the head of the International Mercantile Marine Co. is the record of P. A. S. Franklin. He was born in Maryland in 1871, the son of Gen. W. G. Franklin, who fought for the North in the Civil war.

His early shipping experience was gained in the service of the Atlantic Transport line where he occupied nearly all positions, becoming traffic solicitor, traffic manager, then general manager and finally president. When the Atlantic Transport Co. became affiliated with the International Mercantile Marine Co. in 1902, he occupied an important position in the new line-up and, in 1916, was appointed vice president of the latter company.

Early in 1918 Mr. Franklin was appointed chairman of the shipping control committee. With him on the committee were H. H. Raymond and Sir Connop Guthrie. This committee was set up with the object of putting into more effective use all American tonnage by coordinating the needs of various departments of the government and by effecting real interchange of tonnage and traffic with the allied governments. Mr. Franklin for his valuable work was awarded the distinguished service medal of the United States, the legion of honor of the French government and the order of Leopold by the Belgian government.

Returning to the active control of the International Mercantile Marine Co. after the war he was able, not only to bring this concern successfully through a difficult period, but, by his farsightedness and executive ability, actually expanded its operations.

When approached with the plan for a novel arrangement of the interior decoration of the CALIFORNIA, he was quick to see the value of developing a strictly American style in ships' architecture, and under his direction the original plan was greatly extended.

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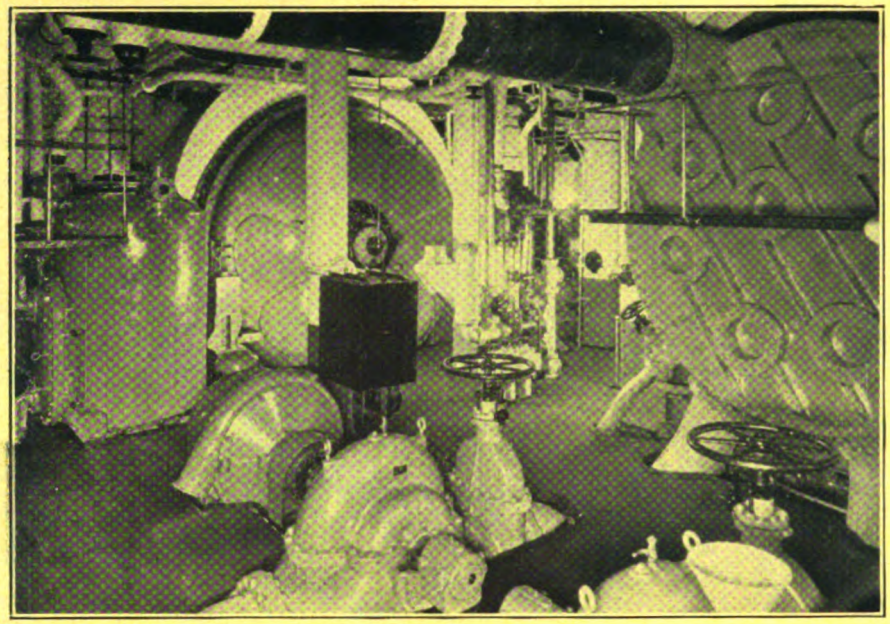

S.S. California—Engine Room. Condensor (Right) Pumps and Propulsion Motor

14, the vessel left the builder's dock and started for New York. She took the northward course about dusk and idled along for several hours, then in the dark, and without the knowledge of the passengers, throttles were thrown wide open and for three hours she did her best, which was about 18.99 knots. This was the average for a three-hour period. There was no vibration whatever and if one had not been told about the full speed operation it would not have been known that such a test was being made. The trip to New York was without feature. About all that the operating force would say about this trip was that the vessel exceeded expectation. Electrical control makes the operation so smooth and simple that it is almost disappointing to an old time seafaring man. The actual oil consumption under test has not been made public, but the operating company reports that the vessel will make 15,000 miles at a speed of 16½ knots on one filling of oil. The tanks hold 5100 tons of oil, or approximately 1,500,000 gallons. This is enough for the round trip from coast to coast with a considerable distance to spare, and the plan of operation is to fill with oil at San Pedro, Calif., where the cost of the oil is about one-half what it is at New York. It is estimated that it will take about eight hours for complete filling of all bunker fuel oil spaces.

Machinery of Modern Design

The general problem of building and operating the CALIFORNIA was carefully studied from the engineer's point of view. Labor saving machinery and equipment have been freely used. All the ship deck gear, except the windlass is electrically operated. Her freight handling facilities have been designed with care to meet special conditions in the intercoastal trade for fast and safe handling of cargo. These include an unusually large number of sideports to permit handling of cargo by electric trucks without hoisting. Sideports are also provided to permit ready access of driven automobiles which will form part of the cargo.

Careful study has been given to the type and location of the ship's deck winches. On A and B decks there are 18 reversible single drum electric spur geared winches arranged in groups, each capable of handling 3000 pounds at 300 feet a minute. There are 12 booms, six on each mast. One of these is a 10-ton boom and the others each have 6-ton capacity. On E deck are 13 reversible single drum electric spur gear winches capable of handling 3000 pounds at 200 feet a minute. These winches are motor driven and are of the latest design. The motors are enclosed in water-proof housings, have remote type of controller and have dynamic brakes for lowering.

The main mooring winch is steam driven, and is designed to take a three-inch manila

Capt. Roger Williams

A DESCENDANT of Capt. Roger Williams of colonial fame, the present Capt. Roger Williams comes naturally by his love of the sea and of shipping. He was born in 1879 *in New York and was graduated from the Naval academy in* 1901. *During the war he was called by Rear Admiral Sims to organize and operate a fleet of colliers between Wales and France and it was here that he gained his first distinction in the business of sea traffic. In* 1920 *he became associated with the International Mercantile Marine Co. and since then has advanced to his present position of manager of operation of this large company which operates* 109 *ships. He is a forceful though quiet man, well liked by all of his associates. He is married, has three children, two boys and a girl, and lives at Forest Hills, Long Island, N. Y.*

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hawser and to exert a pull of 25,000 pounds at 50 feet per minute. It is located directly aft of the windlass on the forecastle head. Three electric mooring capstans are located aft.

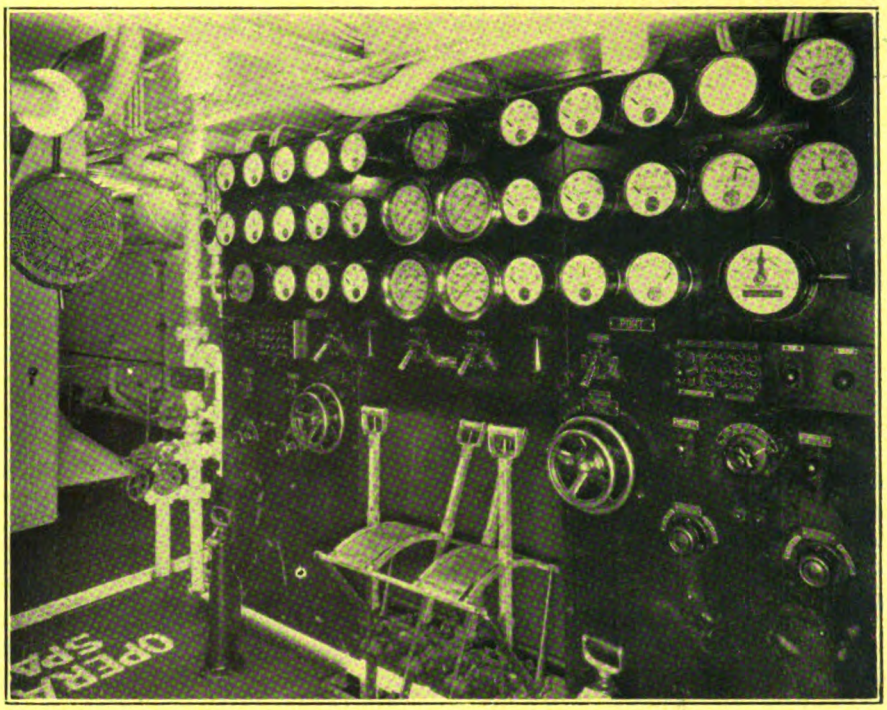
Electric Drive Is Flexible

The propeller shafts of the CALIFORNIA are driven by two General Electric three-phase synchronous induction motors, each rated at 5250 kilowatts, 110 revolutions a minute and 3700 volts. The propellers are manganese bronze of three blades of the built up type. They are 18 feet in diameter and the pitch is 17 feet 9 inches. Electric energy for propulsion of the vessel, as previously stated, is supplied by two independent complete expansion General Electric turbines, each driving a General Electric three-phase generator. These generators have a maximum rating of 6600 kilowatts at 2880 revolutions a minute. The generators are self ventilated and the motors are ventilated by four small motor-driven fans. All of the propulsion machinery is controlled from the main operating panel.

In an electrically driven vessel, such as the CALIFORNIA, many advantages in design and operation at once become evident. The turbo generators, being connected to the motors driving the propellers by electric cables only, may be located at any point desired. This makes it possible to place the boilers and piping as well as the turbo generators and auxiliaries at the best points in the vessel's hull from a marine engineering standpoint. The control of each motor and its propeller is independent of the other. Thus it is possible for quick turning, at once and without the slightest chance of damage, to reverse one motor and propeller, while keeping the other motor and propeller in forward operation. In addition to control features the electric drive makes it possible by checking the amperage reading to adjust the speed of the vessel so as to give greatest economy. The propeller thrust is absorbed by two 41-inch Kingsbury thrust bearings.

Steam Plant Well Designed

The 12 Babcock & Wilcox marine water tube boilers are oil fired by means of 48 Peabody burners. Air for these burners is furnished by four Sturtevant multivane fans capable of delivering 34,000 cubic feet of air a minute, or a total of 136,000 cubic feet of air a minute. The oil is heated to 300 degrees Fahr. by six Todd heaters. Steam is generated at 275 pounds pressure and at 100 degrees Fahr. superheat. Other features of the steam plant include a Griscom-Russell multiscreen feed water filter and three single Davis paracoil feed water heaters, capable of heating 230,000 pounds of water an hour from 100 degrees Fahr. to 230 degrees Fahr. Two of these heaters working in parallel use steam tapped from the main turbines and the third operates on the exhaust from the other two. The condensing equip-



Main Control Board—Engine Room, S.S. California

First Class Smoking Room—Natural Pine Paneling

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ment was furnished by the Worthington Pump & Machinery Corp. and consists of two 2-pass condensers, each having 11,000 square feet of cooling surface. These are served by two 2-stage Wheeler air ejectors and two Warren centrifugal circulating pumps of 8000 gallons a minute capacity each. In addition to this there is an auxiliary condensing plant consisting of two 2800 square feet surface condensers also served by Wheeler ejectors and Warren circulating pumps. Two 3-stage Worthington centrifugal pumps driven by Sturtevant turbines furnish the feed water for the 12 water tube boilers.

Many Automatic Features

In addition to the main generators there are four General Electric 500-kilowatt, 240-volt direct current turbine driven generators. These are for furnishing energy for the cargo handling equipment, for lights, heaters, elevators and the many other electrical features which are described in more detail elsewhere. As an emergency measure two 15-kilowatt, 120-volt direct current generators located on the boat deck are arranged to be driven by two Mathews 30-horsepower gasoline engines and as a further emergency measure for lighting there is a large Exide ironclad storage battery, consisting of 120 cells, also located on the boat deck.

Elaborate automatic steering and control apparatus has been installed. The operation of the vessel is very simple, only three levers being used by the engineer of the watch in this connection. The synchronous control of turbine speed is automatic. Both motors can be operated with the current supplied from a single generator, thus economies may be affected when the vessel is operating at reduced speed. Should it be desirable for any reason to stop one of the turbines it would still be possible to operate the ship with the remaining unit at about 70 per cent of normal speed. The rudder of the vessel is larger than normal design would call for. This is to provide an extra margin of safety when passing at low speed through the Panama canal. The steel rudder post is 23 inches in diameter, and the complete rudder assembly weighs 45 tons, yet this whole unit is moved with the ease of steering a small launch. The control is either automatic, semi-automatic or hand operated. The electro hydraulic steering gear consists of two 75-horsepower, 400 revolutions per minute compound wound motors, each driving a Waterbury hydraulic variable-stroke pump which supplies fluid to the steering gear plungers. These motors can be started and stopped either from the engine room or the steering motor room. The actual movement of the rudder is accomplished by means of four cylinders in opposed pairs. Each pair has its double plunger connected at the center to one end of the rudder crossbar. This equipment which was furnished by the Hyde Windlass Co. gives a rudder travel from hard over at one side to hard over at the other in 30 seconds.

The Sperry gyroscopic compass system is used. This consists of a master compass and four repeater compasses. The master compass and one other are located in the wheel house. One compass is on top of the wheel house and one is at the after steering station. The wheel house equipment among other items includes a Kolster radio direction finder, furnished by the Federal Telegraph Co., an electrical rudder indicator and a voltmeter type shaft revolution speed indicator.

The cargo handling equipment consists of 24 Lidgerwood electric winches. Part of these have a capacity of 3000 pounds at a rope speed of 175 feet a minute, and part of 3000 pounds at 235 feet per minute. There are also two separate electric winches of about the same size. Additional equipment on deck consist of the boat handling hoists which will be described later, and miscellaneous capstans.

Two Otis passenger elevators and one Otis engineer's elevator facilitate travel from one level to another on this 8 deck vessel. There are also two McLaughlin automatic dumbwaiters of 100 pounds capacity each. Mechanical ventilation of passenger and crew spaces is particularly extensive on the CALIFORNIA because of the semitropical nature of part of its scheduled trips. This ventilation is provided by 27 General Electric, motor-driven multivane fans of capacities ranging from 2500 to 30,000 cubic feet a minute.

Elaborate Interior Communications

A Cory mechanical telegraph system has been installed for many services. The engineer is signalled by this means and also instructions for docking and steering are transmitted by it. The whistle can be set for automatic operation or at-will operation as desired. Loud speaking telephone stations are located throughout the engine room and 16 interior communicating stations are provided in the other parts of the vessel. The boat is provided with modern wireless equipment installed by the Independent Wireless company. Radio loud speakers have been installed in each lounge so that passengers may

S.S. California—First Class Bedrooms. At Left—Tandem Type. At Right—Single Type

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Public Rooms Distinctively American

S. S. California—Panama Pacific Line

Library

First Class Lounge

First Class Dining Saloon

Tourist Smoking Room

First Class Smoking Room

Veranda Cafe

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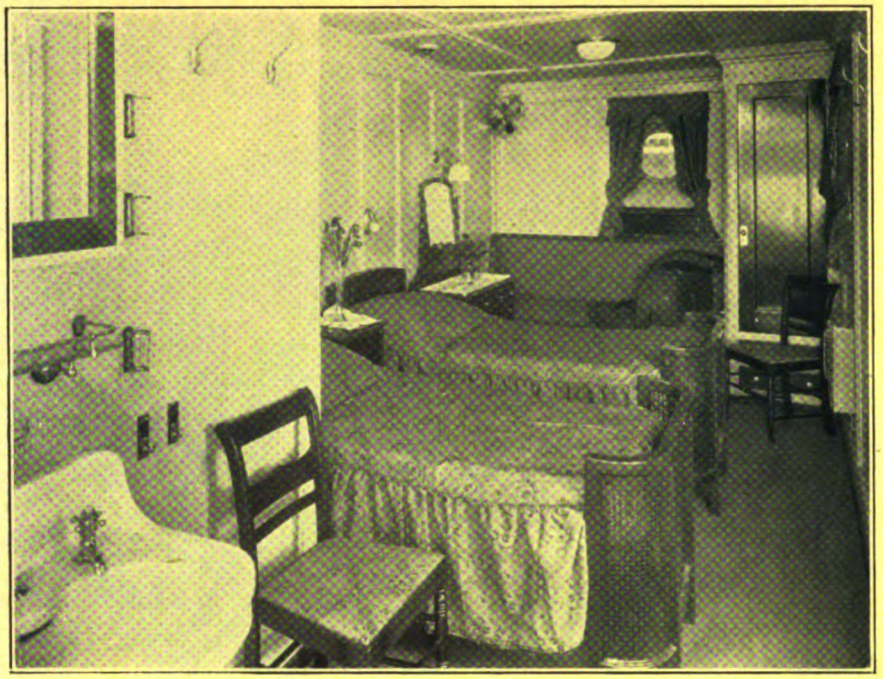


S.S. California—First Class Bedroom

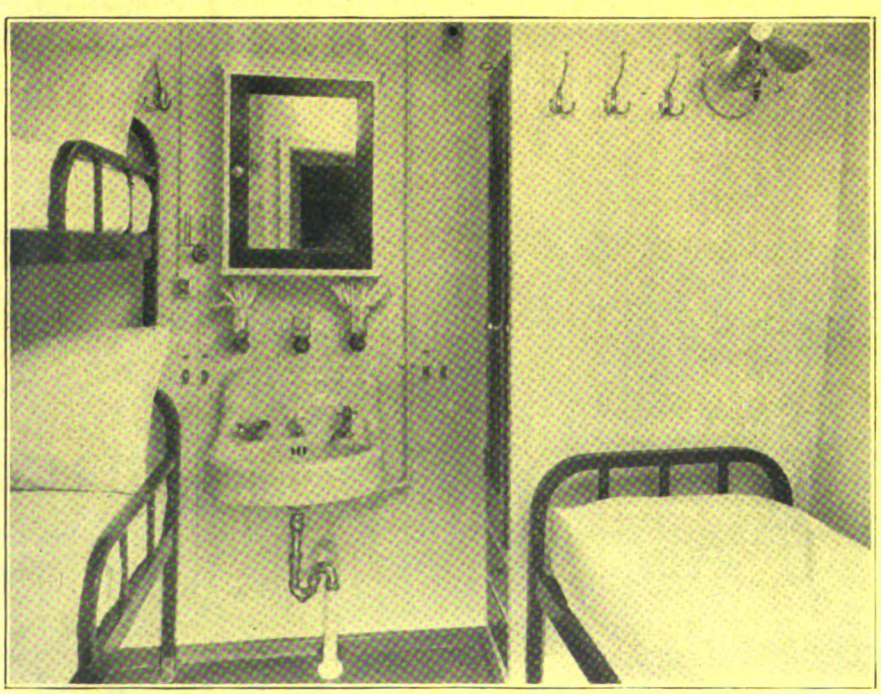
enjoy concerts which may be in progress on land. At either side of the vessel at a level with the top of the pilot house is located an 18-inch Sperry 1000-watt searchlight.

Strong Steel Construction

The hull is of steel, transversely framed with raking stem and a cruiser stern. Some idea of the size of the vessel may be had from the fact that the structural steel used to build it weighed 8500 tons which is more than required for many of the large New York sky-scrapers.

The two steel masts have a height of 175 feet above the keel, necessitating the use of a telescopic arrangement to permit passing under the Brooklyn bridge. The hull is subdivided by 12 water-tight bulkheads and a further protection against flooding has been given by a cellular double bottom which extends the full length of the vessel between peak end bulkheads. The shelter deck is the strength deck. This and all other decks, excepting the boat deck, are steel plated. The general scheme of construction consists of continuous plate and angle girders extending fore and aft under each deck. These girders are supported by three rows of substantial tubular steel pillars.

A subway or steel passageway extends under the passenger accommodations and the freight holds to connect boiler rooms with fireman's sleeping quarters. The boat has two large stacks, one for ventilating the machinery space and the other for the boiler draft. When these stacks were being set in place by the huge dock crane at Newport News, a seven passenger automobile was parked near the end of the dock and the engineer in charge, on a sudden whim, lowered one stack section over this automobile, and there was room to spare.



Tourist Bedroom on the S.S. California

Architectural Features Are Colonial

The Newport News Shipbuilding & Dry Dock Co. turned over the task of planning the public rooms and passenger quarters to J. Philip Kiesecker, a marine architect then associated with the company. Mr. Kiesecker felt that it would be an excellent plan to have the vessel's architectural features distinctively American, and rather than select an independent interior decorating company to handle these, he left the shipbuilding company and associated himself with Barnet Phillips Co., New York decorators and interior architects. This combination proved an excellent one. The Barnet Phillips Co. brought to it long experience in handling the decorative features of public buildings and clubs, and Mr. Kiesecker supplied the experience in marine architectural work. Together, these associates furnished not only all interior decorations in the ship but the actual structural arrangement of the passenger quarters and public rooms.

Barnet Phillips, head of the Barnet Phillips Co., felt that a ship should have a ship-like design. This seems a simple and self-evident fact. Yet few ships in the past have been designed with this feature uppermost. According to Mr. Phillips, imitation plaster, stone and marble have no place on a ship. As he explains it, a ship ought to look shipshape and this cannot be done in using architectural effects usually found in land building construction. The low ceilings of a ship lend themselves to the American-Colonial type of architecture, and wooden paneling is particularly appropriate from a structural point of view because of the slight tendency of ships' walls and ceilings to weave and move under the action of the waves

Starting on this theory a study was made of dignified interiors of early American mansions in New Eng-

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land, Pennsylvania and Virginia and also of examples of architecture in the American wing of the Metropolitan Museum of Art in New York. In the larger rooms of the CALIFORNIA such as the drawing room and ball room lounge, purely Georgian design was followed. In the smoking rooms, natural pine paneling was introduced. Wherever possible, natural American woods were employed. Pillars and cornices in the larger rooms are white pine, finished in tints and because of the style of architecture adopted, hand wood carvings form a more prominent feature than in most any other vessel of modern construction. For this work Virginia wood carvers were called upon to revive the art of wood carving. Long leaf California pine was used for much of this hand work.

In order to have the smoking room true to Colonial practice its wood finish was selected for its knots. These knots when finished by rubbing, present rich dark brown spots of color in the wood. In the dining saloon an unusual effect has been created by introducing mirrors in the dome. These give a feeling of space and distance not otherwise to be had.

A distinctive feature in nearly all of the public rooms is found in the treatment of the ship's port holes. The round port holes are concealed by leaded glass windows in a false or interior wall set a few inches from the side. Carrying out the shipshape idea the floor covering throughout is of rubber tile which is relieved by heavy carpets in many of the rooms.

Colors Used Are Attractive

The drawing room which is farthest forward of the apartments on A deck has walls tinted in cool apple green and has a carpet of American-Saxony weave which has a dark prune colored background. This particular prune color is a shade developed for use as the main motive in the vessel's color scheme. Large original paintings and decorative panels have been profusely introduced into the decorative treatment of the principal rooms. These are nearly all the work of two mural artists associated with the Barnet-Phillips Co., Aldo Lazzarini and Pietro Comandini.

The lighting fixtures were all designed in the studios of the Barnet-Phillips Co. For the most part these are in gold with black striping and the details of the hardware are true to period. The social center of the ship, the lounge, combines the features of a spacious living room and a ball room. It is 46 feet by 50 feet and contains a great bay window, 14 feet wide, on each side and a 16-foot stage at one end. This room has a wood paneled ceiling and walls of a French gray tint. The floor is of hard wood. Other features of the passenger accommodations include a gymnasium, play room for the children and a built-in swimming tank.

The state rooms are all outside rooms following an order laid down by the owners when the plans for the ship were first started. There are 32 bed rooms with connecting private baths and 17 with private shower baths. The general scheme of the state rooms and of the division of accommodations follows the modern tendency toward elimination of third class. On the CALIFORNIA there are first-class rooms and tourist rooms, differing but little in convenience and arrangement.

Wood Carvers of Virginia Revive a Lost Art for the Decoration of the California

Safety Features Are Elaborate

Life on shore is becoming constantly more dangerous but in contrast life at sea is getting safer and safer. This latter fact is due to the better class of vessels now being operated and to the extensive safety measures adopted on the modern liner.

The CALIFORNIA has taken nearly every possible means of safeguarding the life and welfare of its passengers. Although fresh water in abundance will be carried on its regular trips, an emergency plant for distilling sea water has been installed. The equipment of lifeboats furnished by the Welin Davit & Boat Corp., N. Y. includes two 28-foot power boats with capacity for 45 persons each; ten 26-foot lifeboats and twelve 28-foot lifeboats. The Welin type of quadrant davit is fitted for launching the boats. All boats are of metal construction and two of the 28-footers are motor lifeboats. Each boat has a capacity ranging from about 40 to 60 persons. For handling the boats there are on the boat deck four electric motor driven boat winches, each with two horizontal winch heads for manila rope. These are driven through worm gearing running in oil. Each winch is capable of handling a lifeboat loaded with 60 persons. There are also two additional motor driven lowering and hoisting winches.

Many automatic rack and pinion water tight doors are provided to close up compartments in an emergency. Three light steel bulkheads, with hinged fire doors, extend completely across each passenger deck. These are designed to prevent the spread of a superstructural fire from one part of the boat to another. An elaborate fire detecting system extends to all parts of the ship and also an electric-pneumatic alarm system. The boiler and machinery rooms are protected with a Foamite fire extinguishing system and a steam

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smothering system is installed in the cargo holds according to regulations.

The CALIFORNIA is equipped with 330 fathoms of 3⅛-inch cast steel anchor chain made by National Malleable and Steel Castings Co. This chain has been proof tested to over 500,000 pounds, important in the safety equipment of the ship.

Electricity Serves Many Uses

In addition to the main electric machinery and equipment on the CALIFORNIA, many other electrical devices are employed throughout the ship. The staterooms have electric wall heaters. The ship's lighting system consists of more than 4000 bulbs. Electricity runs the clocks in the various parts of the ship and operates the automatic steerer known as "metal mike." Nearly every room on the ship is ventilated by a system using electric blowers. The galley is practically a complete electrical plant. Equipment includes 10 Edison electric ranges of large capacity; an electric dishwasher, capable of handling 11,000 dishes a day; a bakery consisting of two main ovens with a capacity of 180 one pound loaves of bread each; an electric dough mixer; egg beaters; electrically heated service tables; an electric fireplace in the lounge; and the usual telephones, call bells, signal system and searchlights.

Promenade Deck—S. S. California—Panama Pacific Line

Refrigerating Plant Extensive

Near the generator room is a large space devoted to refrigeration. The plant is claimed to be larger than that in any other steamship. This is because the vessel will transport California fruits as a return cargo.

The rooms, which are cooled with a brine mixture, are of two classes. One group, with a capacity of 40,000 cubic feet, has the air below the freezing point and the other group, with a capacity of 60,000 cubic feet, is maintained at a somewhat higher temperature and is known as the cold air storage. The plant itself comprises four Brunswick-Kroeschell 3-cylinder, motor driven ammonia compressors, four ammonia condensers, and four brine coolers. This equipment cools, to a minimum temperature of 12 degrees Fahr., more than 18,000 cubic feet of steward's stores of meats and vegetables and more than 100,000 cubic feet of cargo cold storage. Some idea of the size of the steward's stock rooms may be had from the dimensions of the potato storage room which is 24 feet long, 20 feet wide and 9 feet high. The ice cream room is 24 feet long, 15 feet wide and 9 feet high. This has a capacity of 16 tons of ice cream bricks. A small auxiliary ice making machine turns out ice cubes a ton at a time.

Captain H. A. T. Candy

Capt. H. A. T. Candy, who is master of the CALIFORNIA, is a resident of New York and has been following the sea for 41 years. After service as a young man in the Red Star line, he went aboard the S. S. NEW YORK as third officer in 1900. In 1903, he was appointed second officer of the S. S. PHILADELPHIA. In 1915 he secured his master's license and took as his first command the FINLAND of the Panama Pacific line. In 1916 he became commander of the PHILADELPHIA. After the war, when the sailings of the Panama Pacific intercoastal service were resumed, Captain Candy was again put in command of the FINLAND and later he was placed in command of the MONGOLIA, which position he held at the time he was appointed to command the CALIFORNIA in 1927.

Crew All Are Tried Hands

The personnel of the CALIFORNIA is for the most part headed by veterans of the sea. John Carstairs, chief engineer, was an engineer officer as early as 1893. He joined the American line in 1896 and became chief engineer of the ST. LOUIS in 1902. In 1920 he was chief engineer in the ST. PAUL and later was transferred to the MINNEKAHDA, which latter position he held at the time of his CALIFORNIA appointment. Louis Doughtrey, chief steward, has served in nearly all the Panama Pacific line ships. He was steward of the MONGOLIA at the time of his recent appointment. John Castino, the CALIFORNIA chef, has followed the sea for 25 years and has served in nearly all of the line's vessels. Leo J. Gallagher, the CALIFORNIA'S purser, is a graduate of the American line transatlantic service and a son of a veteran chief engineer of the sea. Mr. Gallagher, senior, was chief engineer of the INDIANA, the vessel in which Gen. Grant crossed the Atlantic on his trip around the world.

Turbine Electric Ship

British marine engineers, in the case of the recently plannel addition of a 19,000-ton 19-knot liner to the fleet of the Peninsular and Oriental Steam Navigation Co., are following the lead of American engineers in recommending turbine electric drive. Lord Inchcape at the annual meeting of the company in London said, "She is to be turbo-electric driven which according to our engineering adviser, Mr. Clarke, will give more economical results than internal combustion engines and a complete absence of vibration. This is not an experiment. There are 51 steamers in commission with turbo-electric drive running most successfully and there are several now being built."

This indorsement of turbine electric drive by thoroughly experienced and hard headed British engineers is another indication that steam has not yet lost its hold.

The famous old Kensington shipyard for years known as the repair yard of the Cramps company, Philadelphia has been sold to W. W. Meirs for $100,000 and an annual ground rent of $212.13.

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British Marine Affairs Improve

Last Three Months Show Notable Advance—Enough Work in Some Yards for All of 1928 — Rates Hold Firm — More Employment for Tonnage

By Vincent Delport
European Manager for Marine Review

SHIPBUILDING and shipping made a notable advance in Great Britain during 1927, and the outlook is decidedly brighter than it was a year ago. Some yards have sufficient orders to keep them busy for the whole of this year. Certain districts dealt in 1927 with the largest tonnage that they had registered for years. The tonnage of vessels launched on the Clyde alone during the year was 464,201 tons, as against 287,240 tons for 1926, and 523,320 tons for 1925. There still is, however, a heavy cloud in the clearing skies; it is that production costs are such as to leave very little profit to the shipbuilding concerns.

There also is competition of the keenest description among British shipbuilders. This means cutting prices to the narrowest limits and forcing the smaller concerns to go out of business, because the larger firms even tender for small contracts which they would not have looked at in previous years. In a recent speech, the Duke of Montrose, a director of William Beardmore & Co. Ltd., suggested that all the Clyde firms should co-operate by obtaining their supplies in bulk, reducing staffs, pooling their experience and economizing in labor and other costs. This proposal was coldly received and the difficulties of the plan are declared to be insuperable. It is suggested that a better remedy is to be found in scrapping a number of berths because, it is claimed, the tonnage-producing capacity of British shipyards exceeds any likely demand for new vessels.

A Scheme to Reduce Cost

A scheme for reducing the cost of building ships is being propounded by Sir Alexander M. Kennedy, chairman of the Fairfield Shipbuilding and Engineering Co. of Glasgow, and chairman of sectional committee 21 of the British engineering standards committee. The idea is to standardize parts which go into the construction and equipment of ships. This would also be economical and convenient in cases of breakdown, when a part could thus be obtained easily and cheaply. According to the figures collected by the chamber of shipping, there is considerably less tonnage of vessels laid up idle in British ports than at this time last year, which indicates that conditions in the shipping trade have improved. There still is a large amount of superfluous and obsolete tonnage which, according to a Stockholm expert, would amount to about 10 per cent for the whole of Europe. Some of this tonnage may eventually be scrapped, but the bulk of it will probably wear itself out.

The shipbuilding activities are illustrated by the figures which the reports issued by certain shipyards give for the year. Harland & Wolff's tonnage output for 1927 aggregated 94,700 gross tons and 80,575 indicated horsepower, the motorship predominating in number, although the largest vessel, the White Star liner LAURENTIC of 18,724 gross tons, is steam driven. The firm was fairly busy throughout the year in the Belfast and Clyde yards, the work in progress equaling in gross tonnage about one-tenth of the total tonnage under construction in British yards as given in Lloyd's returns. The vessels launched include, beside the LAURENTIC already mentioned, five motorships for the King line, five for MacAn-

(*Continued on Page* 76)

Can a Merchant Marine Be Created by Law

The present notable revival in shipbuilding and shipping in Great Britain is indicative of the nation's strong position in the overseas carrying trade. Shipping and shipbuilding and all their ramifications touch intimately the lives and welfare of practically all families of the empire. Britain is old and experienced in trade and on the sea. Geographical position and the inherent qualities of mind and heart, doggedness, adaptability, diplomacy, spirit of adventure, a touch of ruthlessness, the will to dominate and to rule, which characterize the stronger element of her people have made her ships a familiar sight on all oceans in all ports the world over.

Let us think of this when we so blithely talk of creating full fledged, overnight, in six months or in six years, a merchant fleet and a personnel to operate it and a certainty of cargo to make it profitable, all by government fiat. It cannot be done. Underlying economic forces must be taken into consideration and the government can be of vital help in giving support and encouragement to individuals. But to be worth its salt our merchant marine of the future, the one we have in mind, made up of the most efficient ships that modern engineering can produce and manned by officers and men worthy successors of those who at the peak of the clipper ship era made the American sailor respected for his deeds of skill and daring, will only be realized as a result of the process of refinement and stiffening of character due to overcoming natural difficulties.

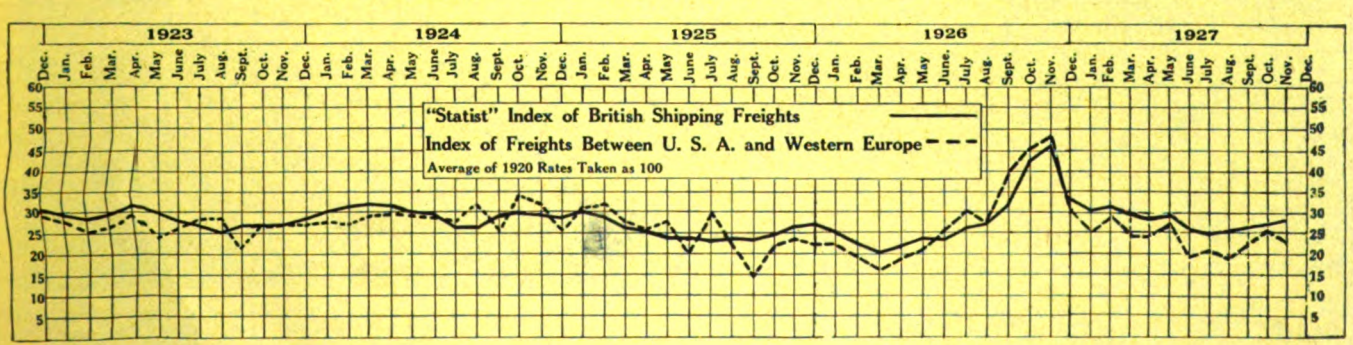

DIAGRAM SHOWING FLUCTUATIONS OF OCEAN FREIGHT RATES FOR FOUR YEARS AND ELEVEN MONTHS

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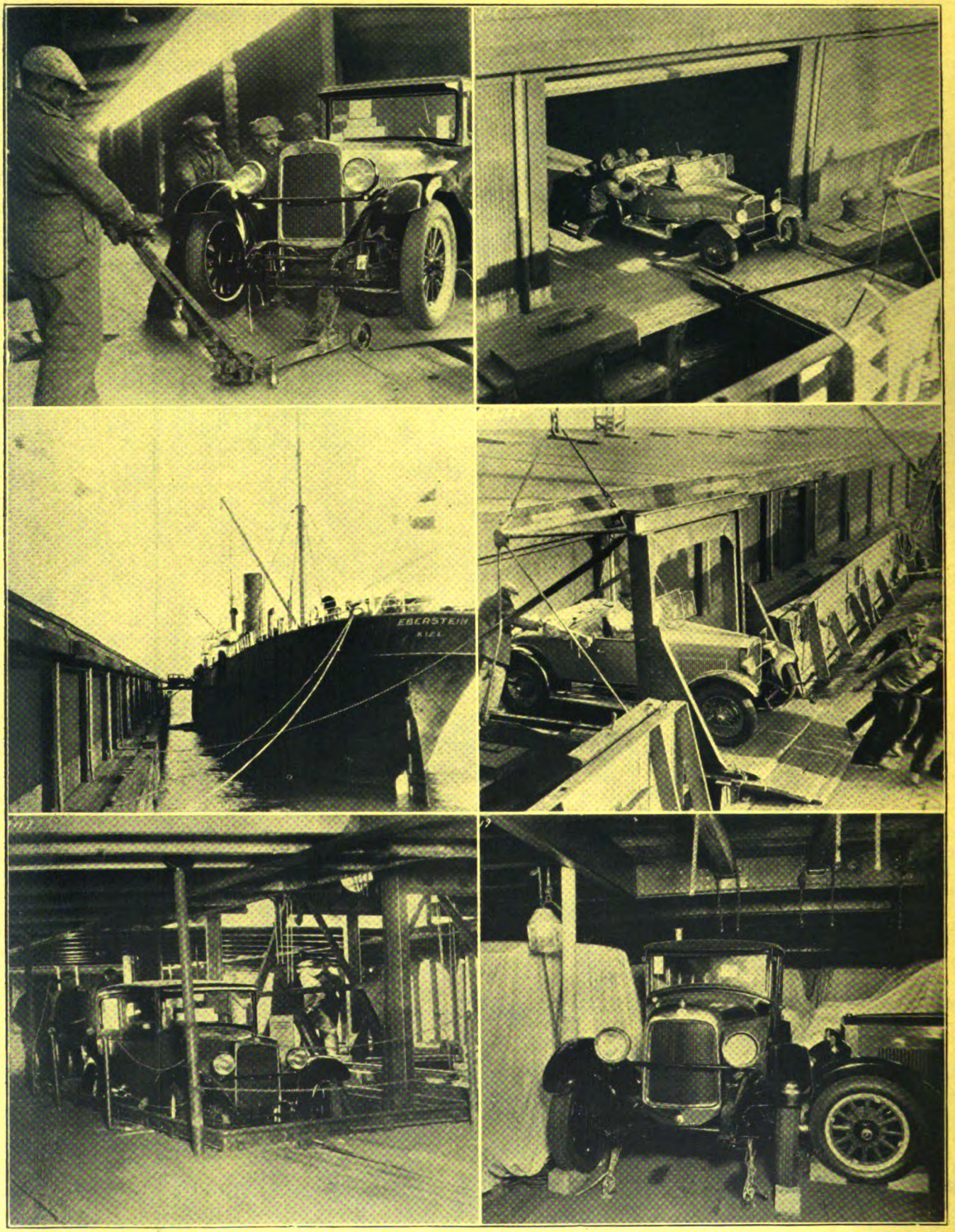
Loading Uncrated Cars on Freighter



HOW AUTOMOBILES ARE LOADED DIRECT FROM RAILROAD CARS TO SHIP UNCRATED. UPPER LEFT—FROM THE RAILROAD CAR TO THE PIER. UPPER RIGHT—FROM THE PIER ONTO AN OUTBOARD ELEVATOR AT SHIP'S SIDE. LEFT CENTER—HOISTING CARS FROM PIER TO LEVEL OF SHIP'S DECK. RIGHT CENTER—TOWING CARS FROM ELEVATOR TO DECK. LOWER LEFT—LOWERING CARS ON PLATFORM SLING INTO HOLD OF SHIP. LOWER RIGHT.—METHOD OF LASHING AND CHOCKING UNCRATED CARS IN HOLD AND COVERING WITH CLOTH SHEETS

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General Goethals Dies

George Washington Goethals, 70, builder of the Panama canal and first governor of the Canal zone, died at his home in New York, Jan. 21. Major

MAJ. GEN. GEORGE W. GOETHALS

General Goethals was a graduate of West Point with a commission of second lieutenant in the engineering corps. After his retirement from active service he organized George W. Goethals & Co., engineers and constructors, and was its president until its dissolution in 1923, following which he became a consulting engineer with offices in New York.

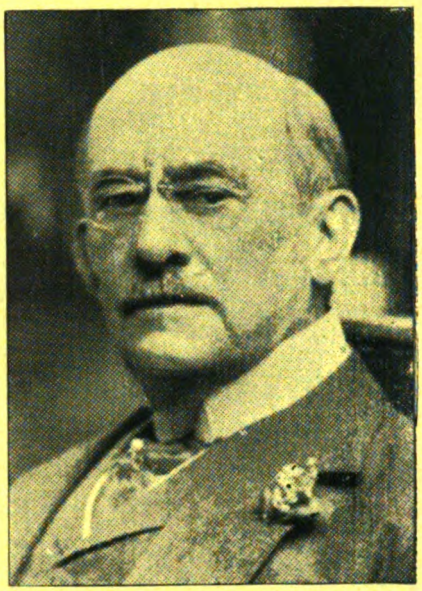
His fame as an engineer and administrator is secure due to the successful completion under his charge of the Panama canal. During the building of the canal he ruled the Isthmus with an iron hand but with human understanding.

D. Z. Norton 1851-1928

David Z. Norton, director of Oglebay, Norton & Co. and vice president of the Columbia Steamship Co., who died in Cleveland Jan. 6, began his career in the banking business in 1868 as a messenger for the old Commercial National bank, now a part of the Guardian Trust Co., Cleveland.

Later he was made cashier, and continued in that position until 1890 when he went with E. W. Oglebay to form Oglebay, Norton & Co., directing the finances. He was made a junior partner and upon the incorporation of the company in 1924, Mr. Norton was named a director, retiring at the time from active business.

Mr. Norton received his early education in Cleveland public schools, following which he attended Kenyon college, Gambier, O., receiving a master of arts degree. He received a degree of doctor of laws later at Western Reserve university, Cleveland.



DAVID Z. NORTON

He was a director of the Union Trust Co., American Ship Building Co., and National Refining Co.; he was a vice president of the Columbia Steamship Co., Cleveland.

Unboxed Automobiles Shipped from New York

THE first complete cargo of unboxed automobiles to be shipped from the port of New York, left recently when the S. S. EBERSTEIN *of the Arnold Bernstein line cleared for Hamburg.*

The EBERSTEIN *cargo consisted solely of Studebaker and Erskine automobiles—550 in all—parked on her decks, row after row, looking just as they would in any garage in Manhattan. The wheels were on, tires were pumped up, and, with the exception of gas and oil, the cars were ready to run.*

"Shipping cars in this manner," said F. R. Lackey, export manager of the Studebaker Corporation of America, "effects a saving to the European consumer of over $160 per car. In the past it has been necessary to disassemble the cars and box them in special export cases. This boxing was expensive and the difficulty of moving the cases added to the handling expense. Duty to most foreign countries is figured on the cost of the automobile laid down in the foreign port. This means duty must be paid on the cost of the case, the cost of handling it and the freight, as well as on the value of the automobile. Any saving that can be made in packing, handling or shipping, reduces the duty and cost to the European consumer."

The S. S. EBERSTEIN *was especially equipped for the transportation of automobiles without boxing. Special trainloads of automobiles are placed on sidings parallel to the dock. Handling is reduced to a minimum. Special crews of men push the automobiles out of the cars, across the docks onto elevators. These outboard elevators extend over the side of the ship to dock level. The cars are then pushed onto the elevators, raised to the level of the main deck, where another set of four elevators lowers them into the hold. In the hold an electric tractor hooks onto the cars, towing them into position and the loading crew lashes them down.*

The lashings are made fast to special steel cables running the entire length of the ship and bolted to the deck every few feet. The cars are first blocked, then lashed to the cables with rope, which prevents any possibility of movement.

Capt. H. K. Kuelson of the EBERSTEIN *said that on his last trip he carried approximately 275 cars in this manner to test the efficacy of this method of fastening. "Two hundred and fifty miles out from Hamburg a hurricane struck us," said Captain Kuelson. "The ship rolled terrifically for over two days, and although I had men in the hold watching the cars day and night —not a single car shifted, nor had we any claim for damage whatsoever."*

F. R. Lackey of the Studebaker Corp. has been one of the staunch supporters of this method of shipment of automobiles. In recognition of this support Mr. Bernstein had the EBERSTEIN *fitted with a special room for the use of Mr. Lackey when the* EBERSTEIN *is in New York. The value of the* EBERSTEIN'S *cargo was approximately $500,000.*

Illustrations on the opposite page clearly show the various steps in loading unboxed automobiles from the pier, to which they are brought direct by rail, into the hold of an ocean freighter for shipment to Europe.

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Shipping Board Steamer Mercer Converted to Burn Pulverized Coal—Maiden Voyage New York to Rotterdam

Pulverized Coal Proves Efficient on Maiden Voyage of S. S. Mercer

KEEN interest in the performance of the shipping board steamer MERCER, converted to burn pulverized coal, continues. In the issue of MARINE REVIEW for December last year there appeared an account of the conversion and trial tests of the S. S. MERCER, including her run on pulverized coal from Baltimore to New York. Since this time she has made a voyage from New York to Rotterdam and return under service conditions. As the successful outcome of this installation is of vital concern to private steamship owners the technical committee of the American Steamship Owners association invited Carl J. Jefferson, head of the fuel conservation committee of the shipping board, and who with Commander J. S. Evans, was largely responsible for the working installation of the system on the MERCER, to give the committee an account of the initial performance of this vessel. Both Commander Evans and Mr. Jefferson sailed on the MERCER'S maiden voyage.

The technical committee of the American Steamship Owners association met at the offices of the association, 11 Broadway, New York City, on Jan. 9. E. C. Bennett, chairman of the committee, presided, and in introducing Mr. Jefferson said in part:

"It is two years ago last December since the technical committee of the association first became interested in this subject of pulverized coal. At that time, Ernest Peabody, of the Peabody Engineering Corp., was our principal speaker, and Mr. Jefferson and others took part in the discussion that followed. At that time pulverized coal was in somewhat of an experimental stage. The fuel conservation committee and the navy department working together at the League Island navy yard, Philadelphia, made such progress that 12 months later we asked Mr. Jefferson to report progress, at which meeting Mr. Jefferson showed that they were getting within sighting distance of success. Since then, you gentlemen know, they have completed their tests at the League Island navy yard and have carried that successful experimentation to a successful voyage of the S. S. MERCER on a transatlantic trip. Of course it is quite a big jump from a single boiler on shore in a test plant to a three-boiler installation on a ship; therefore, we are awaiting with a great deal of interest anything Mr. Jefferson has to say to use today on the voyage of the MERCER.

"From the account that I have received from him and from the shipping board, I think no ship on its trial was ever worked out under such unfortunate weather conditions. A desirable trial trip should have balmy winds and smooth seas. Mr. Jefferson tells me that the MERCER encountered gales from the time she left New York until arrival at Rotterdam. I understand they had the same experiences coming back. So that while the tempestuous weather reacted unfavorably on the ultimate theoretical efficiency the MERCER is capable of in using pulverized coal, it proved that for a seagoing proposition the use of pulverized coal is a huge success."

Mr. Bennett then introduced Mr. Jefferson. With a minimum of editing, in order to preserve the speaker's rather piquant salty flavor, he spoke about as follows:

"When Mr. Bennett asked me to address the association again, I was reluctant to do so because I felt I had talked enough, and wanted to have Commander Evans come over and give the talk instead. Unfortunately, the commander was occupied with some work in the navy department and could not come.

"The MERCER, as you all know, sailed away from New York with pulverized coal; she sailed across the

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Atlantic on pulverized coal; she sailed into Rotterdam on pulverized coal; she gave a couple of demonstrations in Rotterdam for the benefit of the engineering fraternity of Europe; she sailed out on pulverized coal; she sailed on pulverized coal back across the Atlantic, and came into New York on pulverized coal. That is something in which we who have anything to do with this development work feel we have a right to have a certain amount of just pride, because a great many people on the beach predicted that within the first 500 miles there would be another CYCLOPS —we would disappear from the face of the seas and nobody would know what had become of us. We did not. She moted and she moted very prettily.

"While we were on board we would like to have had better weather. I do not like to be seasick; most folks do not. Generally I am not. I was on this trip, not very long but long enough to know that it is unpleasant. But now that it is all over, I am glad we had that kind of weather, because if the plant will function under the type of weather we had on this first trip, I think it will function at any other time.

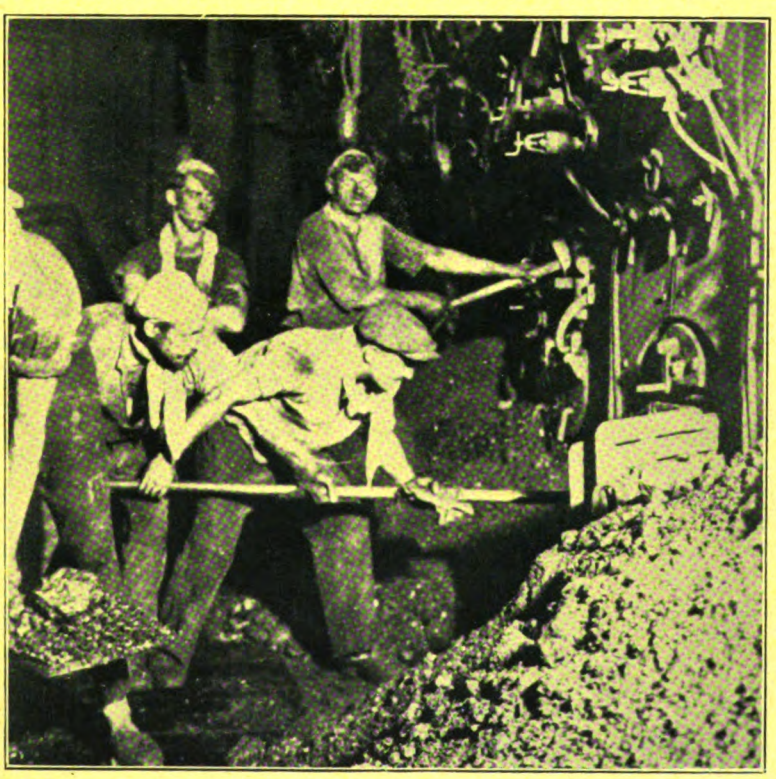
Further Development Work

"The first voyage of the MERCER, as has been said several times, was simply a continuation of the experimental work that has been carried on at the navy yard. The MERCER is not the last word in pulverized coal by a considerable margin. There will be development work continued on her; future installations will probably be quite different from the original installation. By the time the ship owners commerce to adopt this type of fuel and build their own plants, they will do considerable development work, and within a few years we will have a standardized plant, produced by the process of evolution. "She is a 9500-ton ship, built by the Federal Shipbuilding & Drydock Co., Kearny, N. J., fitted with 2500-horsepower General Electric turbine, three scotch boilers, and auxiliaries usually found in a cargo ship of her size. Among other things that she had was a wartime stack. At the time of the war construction it was the policy to use the shortest stack possible to keep down the visibility. As we have been operating these ships we have raised the stacks on practically all of her sister ships. We still have one sister ship who has the original short stack that the MERCER had when she left the yard. This morning we received a request from the operators of this particular ship to raise the stack. She is an oil burner. Why is the request made to raise her stack? Because when in a head wind, the soot from her boilers, especially when blowing tubes, dirty up the after deck. That particular vessel is an oil burner. With pulverized coal where you are passing your ashes through the stack you can imagine how much more aggravated the condition can be. I remember about the fifth day out we were bucking into a head wind. The slip for that day was 26 per cent. Mr. Meurk can appreciate just what that means on that type of ship. Twenty-six per cent is a very high propeller slip for that type of vessel. It generally runs about 5 or 6 per cent. The mate looked on the after deck and he said, 'As long as I have been going to sea, engineers have tried to get the deck force to haul their ashes up to the top side. By golly, they have done it now.' They had to get the hose out and wash it down.

"With a beam wind, this sooting of the decks, even with the short stack, did not prevail, but as I say, with a head wind, inasmuch as the top of the stack was on the level with the hurricane bridge, the wind would sweep down with a swish and carry it right down to the after deck. We did get ashes on the after deck—not coal but ashes, and they were not hot ashes. The stack gases, as a matter of fact, at the base of the air heater at no time was greater than 520 degrees. By the time they left the air heater and superheaters they were generally down around 380 or 350. "The Mercer installation is the work of American engineers. The burners, the distributors, the pulverizers were all designed, built and installed and operated by American engineers. I want to emphasize that fact because I have noticed in several of the Continental papers statements to the effect that the equipment on board is covered by patents which originated with some Brit-

Brain Replaces Brawn Using Powdered Coal

The illustration below shows graphically how hopelessly antiquated is the present universal method of hand firing on board ship. This last hard physical labor, its efficiency at the best depending on the vagaries of personal skill, must be overcome. It is almost unthinkable that this particular operation should have been passed by with little or no attention paid to a possible solution; especially so in this age of mechanical genius where machines have been developed to relieve labor and to enormously increase output in all lines of endeavor. Perhaps the popularity of oil firing, which also at first reduced fuel cost, actually retarded the inevitable experiments in pulverized coal that now in the successful practical demonstration on the MERCER *promises not only a relief from the intolerable labor of hand firing but also increased efficiency and lower fuel and operating cost. The* MERCER *has made engineering history and progressive shipowners will not be slow to apply the lesson.*



"HELL WITH THE LID OFF"—FLASHLIGHT PHOTOGRAPH OF STOKE HOLD OF HAND FIRED COAL BURNING FREIGHTER—A METHOD STILL IN USE

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ish company. This is not the fact. The burners and the distributors were designed and built by the Peabody Engineering Corp., which is a firm located in New York city. The pulverizers were built by the Kennedy-Van Saun Co., which is an American firm doing business in New York city. The conveyors were built by the Link-Belt Co., which manufactures in Philadelphia. The crushers were built by the Jeffries Co. in Ohio. It is strictly an American product, the installation of course, being made, as you all know, at the Maryland Drydock Co., Baltimore. The engineer personnel was composed entirely of American licensed engineers. The experimental work that produced the plant was carried on in an American institution, namely, the Philadelphia navy yard, under the supervision of a naval officer, Commander J. S. Evans.

"The vessel was bunkered with ordinary North Atlantic range fuel, good fuel, nothing extraordinary about it. In fact, it contained a much larger percentage of slack than could be handled on grate bars. The fuel analysis shows 14,200 B.t.u., about 7 per cent ash, about 1½ per cent sulphur—good bunker fuel, outside of the fact that there was a much higher percentage of slack than you would ordinarily have.

Enough Bunkers for Return

"When we arrived at Rotterdam we checked up the bunkers and saw we had enough to come home with, but it was decided to take on about 300 tons of Rotterdam coal to experiment with on the way back. When the MERCER arrived, I asked the boys how the Rotterdam coal worked. They said, 'Well, we could not make as much steam with it as we could with the other coal. We apparently could not force the boilers as we could with the American coal.' The idea came to my mind that probably they could could not pulverize it as well as American coal. This morning I received an analysis from the laboratories that this coal had a B.t.u. content of 12,400. The ash content was 14 per cent. There was 3½ per cent sulphur. So it was quite apparent why they could not make as much steam with it as they could with American coal. Pulverized coal does not make B.t.u.'s, it just uses them, and if you do not have the same heat value in a pound of that fuel as you do in a pound of another fuel, you will not obtain the same evaporation. It would, therefore, seem advisable for ships that are bunkering at all ports of the world, after running into such fuel as we took on at Rotterdam, to be prepared to use a full boiler power.

"On the MERCER we only used two boilers for the entire voyage. We had a sailing schedule mapped out for us which was being met by the sister ships and which was beaten by the MERCER by 36 hours. This she did with two boilers, and she did it with a high percentage of poor coal.

"As I said before, and I would like to emphasize that fact, I think ships that are going to bunker at various ports of the world subject to all types of coal should be prepared to use all their boilers. We were prepared to use all our boilers, but we had made the outbound passage on two boilers and as Commander Evans and I left the ship at Rotterdam, and the operating personnel who were bringing her back felt they were going to do as good as we did, or a little bit better, and I think they did.

"The question of whether or not the slow speed mill would operate in a seaway was an open question when we sailed away. We had sailed up from Baltimore and we had gone around to Philadelphia. In fact, we had about a thousand miles under our belt before we sailed, but we had never had real sea weather until we got outside. I am prepared now to say that the slow speed ball mill will function at sea satisfactorily. The cascading of the balls and the pitch, or rather the roll of the ship, do not synchronize and, therefore, you obtain your pulverization. The mills had been tested quite thoroughly at the navy yard before we made the run on different grades of fuel. We had used fuel from 17 per cent to 35 per cent volatile. I knew that we could get practically a uniform pulverization through this range of coal and over a fairly wide range of capacity. But as I said before, we were not sure that when the ship commenced to roll (and she did roll, she went through an arc of 36 degrees), that cascading would continue and that you would obtain pulverization. The samples that we collected on this voyage show practically the same degree of fineness that we attained at the test plant.

European Ship Owners Interested

"When we arrived on the other side, there were about 20 people standing on the dock waiting to board the ship, which I thought was quite a reception. We did not know anything about receptions. There were 300 engineers from Denmark, Sweden, Holland, Germany, France, Wales, Scotland, England, Ireland—all over Europe; they were big men, men operating a lot of ships, and they came down to see this little freighter. We were tired, dog-gone tired, 14 days and 7 hours of heavy weather; we felt like going ashore, but they were so insistent that they should see the plant at once that we had to have a demonstration on board the vessel that night. We selected some twenty-five men from the big party to go through, including representatives from the British admiralty, and especially Captain Brandt of the Australian navy, who has done a tremendous amount of pioneer work in pulverized coal in Australia during the war. The next day we had to have another demonstration on which we took some hundred people through the plant, and the following day, on Saturday, we had to keep the ship open from 10 o'clock in the morning until 5 o'clock at night to take care of the balance.

Eliminates All Hard Labor

"The plant is simple. I have seen periods of 72 hours at a time down in the fireroom when all the firemen had to do was to polish up the lamp black that Mr. Bennett helped to put on those boiler fronts when he rode up with the 'dirty dozen.' The plant is simple to operate when it is moting in good form. On this initial trip there were mechanical difficulties which are expected on new installations, not big jobs, just little picayune things which are most exasperating; a little inch and a half bearing that probably should have been a two and a half inch bearing, can give a lot of trouble. Those mechanical defects showed up, especially after you have been rolling around, with whip action in the shaft coming into play. Fortunately, we had a lathe, a drill press and some men who knew how to run them, and all these defects as they arose were corrected. That is why the MERCER was able to sail out on pulverized coal, sail across on pulverized coal, dock with it, and repeat the performance homebound, because the things that did arise were not big enough to prevent the ship's force from taking care of them.

"I do not think it advisable to give fuel figures on what we did. I think it would be misleading. An initial, experimental voyage of that sort cannot be taken as a true criterion of what can be done. I will say this, however, that we gave figures in a paper which we presented before the naval architects that have been equalled and bettered on this voyage. After this vessel has been in service three or four voyages, maybe then it will be time to say what she can do regularly. I do not want to say that now. I want to see what an operating personnel will do with that ship when they do not have people who have

(*Continued on Page* 70)

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Latest Marine Events in Pictures

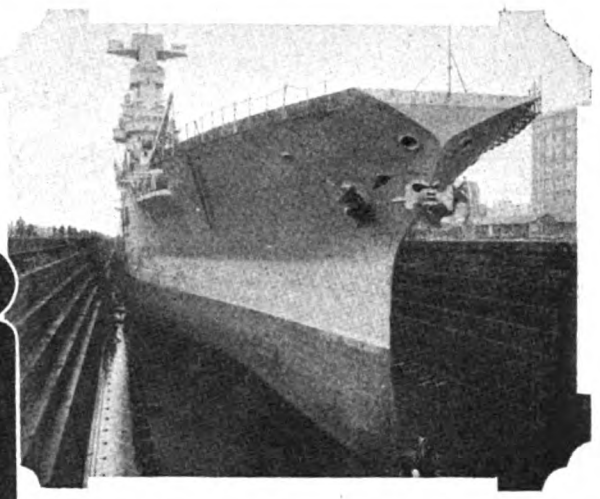
Below—Canadian Pacific liner Duchess of Atholl launched at William Beardmore, Nov. 23, 1927. Gross tonnage 21,500

At Right—Airplane carrier Lexington in drydock, Boston, Jan. 12, preparatory to trials. Length, 880 feet; displacement, 33,000 tons.

At Left—Saratoga as she will appear in action. Painted for General Electric by W. L. Green

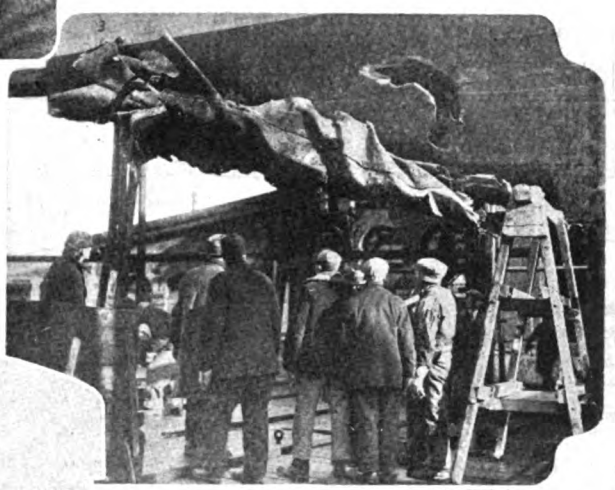
Photo by Marceau

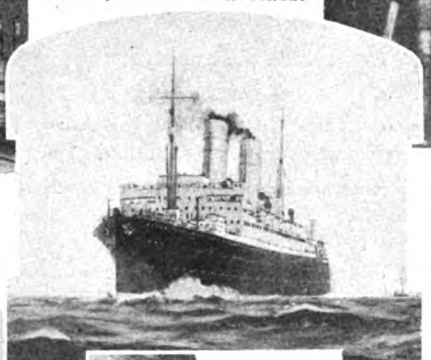
H. E. Frick, vice president of the Export Steamship Corp.



Below—Bow of destroyer Paulding after her collision with submarine S-4 which sent the latter to the bottom with the loss of all on board. The Paulding was in the service of the Coast Guard at the time of the accident in Provincetown harbor, Dec. 17

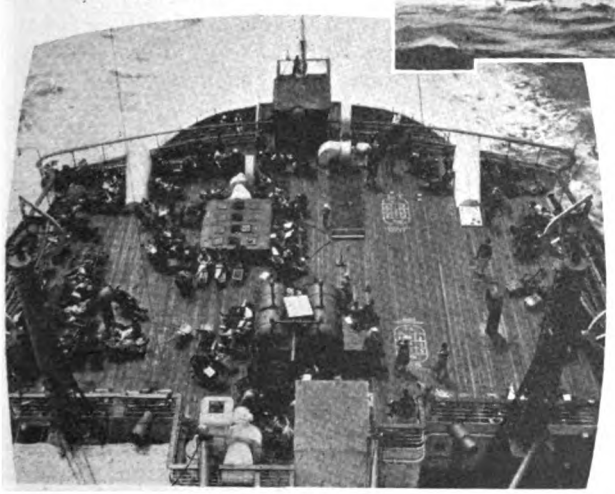
Below—Artist's drawing of liner at left. Speed, 17½ kts., deadwt., 8750 ts., length 600 ft., beam, 75 ft., depth to bridge dk., 52 feet, draft 27 ft. 600 cabin, 1000 third class.



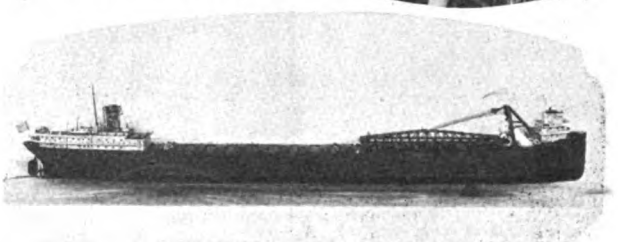


Below—Aerial view tourist deck of the Leviathan, flagship of United States Lines, taken at sea

At Right — Cure for seasickness by Dr. Dammert. Gas is inhaled to ward off attack or to cure if ill



Below—Model of self-unloader Carl D. Bradley, presented to Carl D. Bradley, president of the Bradley Transportation Co. Built by B. E. Foster. Delivered record cargo, 15,724 tons limestone to Buffington, Ind. Unloaded in five hours



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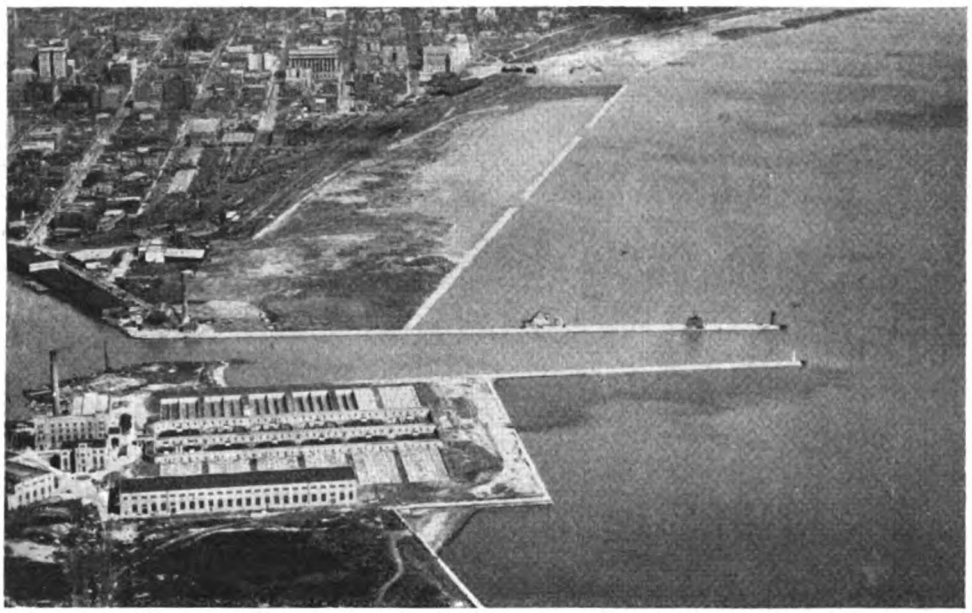
Dock Management Progress Section

How Successful Dock Operators Have Met Problems of Giving Best Service to Ships



Milwaukee—North Harbor Tract—Maitland Air Field—New Sewage Disposal Plant in Foreground

Milwaukee Develops Its Harbor for Present and Future Needs

By K. A. Albrecht

THE Great Lakes constitute, with their connecting waters, one of the most marvelous highways on earth, and yet, though the annual tonnage movement is enormous, they have only reached the dawn of their potential service. The large tonnage movement supplemented by the increasing agricultural production in territory adjacent to the Great Lakes and the large growing industrial cities bordering its shores must find cheaper methods for world-wide distribution. Cheap water transportation is one method of successfully competing in the domestic and foreign markets.

The city of Milwaukee is one of the few port cities bordering the Great Lakes that has realized the future of water transportation. Adequate and co-ordinated terminal facilities is not only a means of promoting greater waterborne commerce, but is a stimulus to industrial expansion. Milwaukee realizes the necessity of properly co-ordinated rail and water facilities and is undertaking a construction program which will provide adequate facilities for present as well as future waterborne commerce. The construction program not only concerns Great Lakes traffic but is also mindful of the inevitable Great Lakes-St. Lawrence ship channel.

The present waterborne commerce of Milwaukee, exceeding annually seven and one-half million tons of freight, is conducted on the inner harbor, which consists of the Milwaukee, Menomonee and Kinnickinnic rivers. The three rivers flow through the business and industrial sections of the city from the northwest and south respectively and converge at the harbor entrance, each river be-

Learn from Milwaukee

The proper development of harbors has not kept pace with the rapid growth of water borne tonnage on the Great Lakes. The city of Milwaukee is one of the few ports on these waters which realizes with sufficient force the importance of port development, to supplant interminable discussion by actual construction. It has acquired control of its waterfront, and unhampered by individual interests it is going ahead for the welfare of the whole community in the actual work of carrying out a complete far-seeing harbor project anticipating future needs and expansion. Other ports of the Great Lakes and particularly Cleveland can learn much by a study of Milwaukee's project.

The author, K. A. Albrecht, is harbor traffic director for the Board of Harbor Commissioners, City of Milwaukee. This story was prepared for MARINE REVIEW at the request of the Editor. All of the photographs were taken by the Aerial Photographic Service Inc., of Chicago, during April, 1927.

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ing navigable for a certain distance for the accommodation of Great Lakes vessels.

All docks and warehouses on the rivers are privately owned and operated. The railroad-owned facilities are, in some cases, leased to steamship companies and private warehouse operators. Several are operated by the railroads for direct interchange of tonnage with the vessels. The twenty-eight bascule bridges across the navigable portions of the rivers necessitate a tremendous and growing operating and maintenance expenditure by the city. The opening and lowering of the bridges throughout the navigation season for upwards of ten thousand ship entries and clearances decidedly interferes with land traffic. The healthy growth of the city and commensurate business activities increase land traffic, which means more and wider thoroughfares and more bridges.

Milwaukee—Menomonee River—Canal System, Dock Warehouses, Grain Elevators, Coal Docks and Industrial Plants—Lake Freighter shown at Left

Plan Outer Harbor Development

The city of Milwaukee realizes that an outer harbor development program will assist greatly to minimize commerce on the rivers and will be a partial solution to the problem. The tendency of increasing tonnage and deeper draft vessels on the Great Lakes makes it more difficult for the rivers to accommodate the vessels. As far as possible, the tonnage must be moved from the rivers to the outer harbor where deeper water and easier methods of operations are assured. It is for this reason and the realization that Milwaukee's diversified industrial existence depends, to a considerable extent, on cheap water transportation, that the city of Milwaukee will provide adequate facilities on the outer harbor for the interchange of commerce as between water carriers, rail and motor trucks.

During the past years the city has been busy acquiring its lake front property, until today, it is the only port on the Great Lakes which owns the entire riparian rights.

In June, 1919, by legislative enactment, the city of Milwaukee was granted authority to create a board of harbor commissioners with power to plan and execute harbor improvements and to provide for the construction of docks, warehouses, rail connections, etc.; to fix and regulate charges for the use of publicly-owned facilities—all subject to the approval of the common council. In 1919 the board of harbor commissioners was reorganized in accordance with the law, and since that time has busied itself with the acquisition of lake front property, establishing dock lines, dredging and reclaiming land, building breakwaters and revetments and preparing a comprehensive plan of outer harbor development. Many difficult problems were encountered, but with the able assistance of the United States army engineers, the problems have been solved so that today Milwaukee is actively engaged in a construction program.

Breakwater Under Construction

The federal government is building a breakwater, which is nearly three-fourths completed, at an expense of five million dollars, which will turn the inner portion of the bay into a land-locked harbor. At the present rate of construction it is expected that the breakwater will be completed

Projected Plan for Development of Milwaukee Harbor—Compare This with Actual View on Opposite Page

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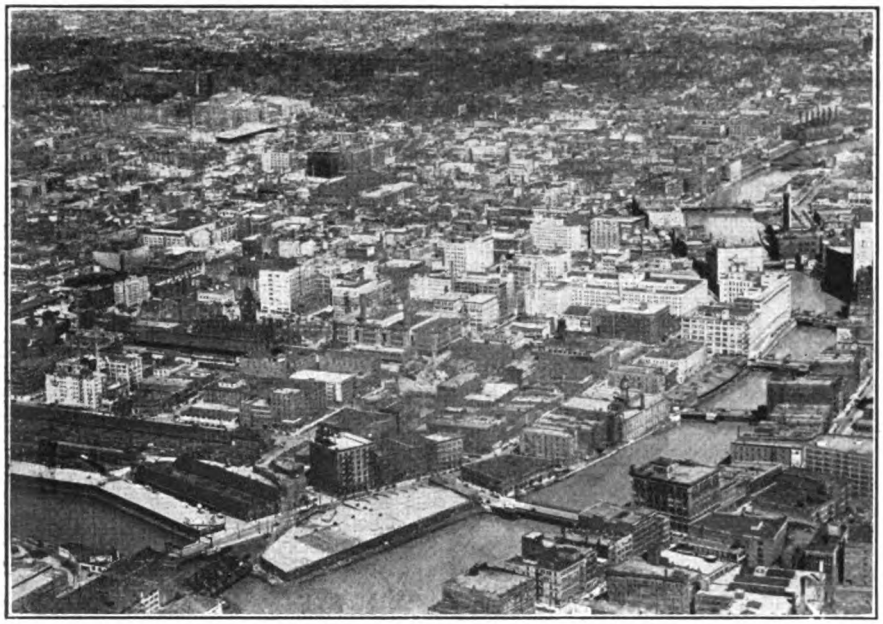

Milwaukee River Through Business Section of City—Annual Waterborne Commerce 837,000 Tons

in 1929 if present progress continues.

In addition to the land purchased, the port authority is filling in several large tracts of submerged land and when completed, the public port or outer harbor will have at its disposal, for development purposes, approximately two hundred and twenty-five acres with a water frontage of about two and one-half miles. The present outer harbor development is confined to the tract of land south of the harbor entrance.

The north harbor tract is being used temporarily as Maitland air port, where mail, commercial and passenger planes find it convenient to operate.

The first essential step has been taken in the port development plan to have all railroads connect on an equal basis directly with the harbor property.

Carferry Slips Improved

The two carferry slips are the first units in the outer harbor development and are located inside and at the left of the harbor entrance just south of the new sewerage disposal plant on the Kinnickinnic basin. The contract for dredging of the slips and reclaiming land on the lake front to accommodate the carferry rail layout has been completed. Approximately 400,000 cubic yards of materials were moved as a first step in this development. The carferry companies are assured a quick turnaround with no bridge obstructions. The service yards immediately adjacent to the slips are designed to accommodate 128 cars or four carferry loads, and a carferry in either slip can be loaded from either service yard.

Direct rail connections will be made from the railroads to the classification yard which is designed to hold 400 cars. The capacity of the two slips is established at 24 boats each 24 hours, and the present adjacent rail yards are designed to permit expansion up to this maximum. The efficiency of the rail layout will permit carferries to be unloaded and loaded with a minimum loss of time and it is estimated that the new arrangement on the outer harbor will decrease the turn around for this type of vessel by one hour. The result of the new development will give a carferry company now operating into Milwaukee a direct connection with a desired railroad and will bring into Milwaukee a new company to operate carferries across Lake Michigan, connecting with an eastern trunk line railroad.

Plans for an open dock, connecting directly with all railroads to handle heavy freight, are under way. This dock with shipside tracks and heavy lift equipment, such as locomotive and gantry cranes, magnets, buckets, hoppers, track scale and tractor crane is being designed to handle structural iron, steel bars, plates, rail, pig iron, scrap iron, wood pulp, phosphorus rock, iron pipe, etc. This dock will be located on the south harbor tract. Quantities of heavy freight is now brought into Milwaukee by boat during the navigation season but the present river facilities are of such a makeshift character that no attempt has been made on the part of the larger industries to employ water transportation. This facility will enable industries to utilize water transportation on heavy freight from eastern steel plants, and to ship from Milwaukee, agricultural implements, tractors, harvesting machinery, road machinery, etc., to eastern lake terminals.

Passenger and Package Freight Pier

The third unit under consideration is a passenger and package freight pier extending from the lake front of the north harbor tract. The present docks and dock warehouses on the rivers utilized by the package freight lines are narrow—one story, obsolete structures with no modern mechanical equipment to handle the tonnage. Most of the steamship lines will move to the outer harbor where direct rail connection, ample trucking space, storage space and docks will

(*Continued on Page* 68)

Kinnickinnic River—Chicago & Northwestern Grain Elevator—Grand Trunk-Milwaukee & Pere Marquette Carferry Slip

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Four-day Transatlantic Liners Projected

On Jan. 9, it was announced that the Trans-Oceanic Corp. of the United States had been incorporated in Delaware with a capital of $50,000,000 by Lawrence R. Wilder, chairman of the shipbuilding division of the American Brown Boveri Electric Corp., and others. Mr. Wilder states that the company proposes to construct six, 35,000 ton liners capable of crossing the Atlantic in four days, with sailing every other day. The cost per vessel it is estimated will be about $21,000,000 or about $125,000,000 in all.

An important part of the plan calls for a loan from the shipping board of $90,000,000 at a low rate of interest to finance this ambitious program. The shipping board has agreed to have the plan of the new corporation laid before it at a hearing in Washington on Jan. 24.

Studies have been made of the proposed design even to the extent we believe of towing a model. At any rate the vessels are to be about 900 feet long and are to have a maximum speed of 33 knots. Accommodations are to be provided for 800 persons. Airplanes will be used to supplement the vessel service to provide a two-day crossing of the ocean for mail and express matter and passengers wishing rapid transportation.

In order to insure the practicability of the plans for these ships a committee on naval architecture was appointed by the Trans-Oceanic Corp. with the request to make a formal report. Such a report, signed by Dr. Herbert C. Sadler, professor of naval architecture at the University of Michigan; Ernest H. Rigg, naval architect of the American Brown Boveri Electric Corp., Theodore E. Ferris, naval architect of New York and Dr. Elmer A. Sperry, president of the Sperry Gryscope Co., New York, has been received.

This report states that, "there is no reason why this high speed is not practicable for passenger ships, giving adequate size, good design, and frank recognition of the fact that heavy weather will have to be met at reduced speed". The service is to be between a port in the United States (and in this connection Montauk Point, Long Island and the vicinity of New London on the Connecticut shore have been mentioned) and channel ports. Sailings are to be every other day to be later expanded to a daily service.

The Panama Railroad Steamship Co. is planning the construction of two new passenger vessels. Further details of this report indicate that geared turbines driving twin screws and furnished with steam by Babcock & Wilcox watertube boilers at 300 pounds pressure and 150 degrees superheat will be used as propulsive power. All auxiliaries are to be electrically driven. Plans and specifications have been prepared by Cox & Stevens, naval architects, New York, N. Y.

Fire Destroys Mail for Marine Review

The building in which a large proportion of incoming mail for the City of Cleveland is received was completely demolished by fire during the night of January 27. Practically all of the usual mail which comes to the Penton Publishing Co., Penton Bldg., Cleveland, publisher of Marine Review, was destroyed. We therefore respectfully request that all mail intended for Marine Review due in Cleveland on January 27-28, be duplicated.

Radiomarine Corporation

The Radiomarine Corporation of America was incorporated on Dec. 31, 1927, to take over the marine business of the Radio Corporation of America and the Independent Wireless Telegraph Co. Inc. The assets of the latter, such as plant, stores, coast stations, ship contracts and good will, were transferred to the new corporation as of Jan. 1.

At a meeting of the board of directors of the Radiomarine corporation on Jan. 11, the following officers were elected: Chairman of the board, Gen. James G. Harbord; president, David Sarnoff; vice president and general manager, Charles J. Pannill; vice president and general counsel, William Brown; treasurer, George S. DeSousa; assistant treasurer, Alexander Nicol; comptroller, Charles J. Ross; secretary, Lewis MacConnach.

Appointments were made in part as follows, effective Jan. 1: General superintendent, T. M. Stevens; commercial manager, W. G. Logue; assistant general superintendent, P. C. Ringgold; traffic superintendent, A. J. Costigan. Divisional superintendents were also appointed: G. Harold Porter, manager Pacific division; J. B. Duffy, superintendent eastern division and George E. Cole, superintendent Great Lakes division.

Foreign Trade Carried in American Ships

The United States shipping board has prepared a large chart printed in colors giving a graphic picture of the decline of American shipping in foreign trade. On this chart is erected flag poles at intervals of ten-year periods from 1830 to 1920 and then for the years 1924, '25, '26 and '30. These flag poles, in height, represent the total of our foreign trade for each period. An American flag in colors is located to show the percentage of this trade carried in American bottoms.

For instance in the year 1830, 89.9 per cent of our foreign trade was carried in American ships. In 1860, 66½ per cent was carried in American ships; in 1890, 12.9 per cent and for the years 1920, '24, '25 and '26 the percentages carried in American bottoms were respectively 42.7, 36.3, 34.1 and 32.2, showing a steady decline from the after war peak.

The flag pole on this chart for 1930 has a question mark opposite. Around the borders of the chart are quotations from six Presidents of the United States, from the chairman and various commissioners of the shipping board and others, one of these, Capt. Robert Dollar is quoted as saying, "You cannot separate foreign trade and shipping and stay in the shipping business. One is dependent on the other."

Admiral Blue 1865-1928

Rear Admiral Victor Blue, United States navy, retired, died on Jan. 22 on a train near Lannin, S. C. while on his way to Washington for treatment at the Walter Reed hospital. He had twice been chief of the Bureau of Navigation. He was born in Richmond County, N. C., Dec. 6. 1865.

The most outstanding act of his career occurred thirty years ago while a lieutenant attached to Admiral Sampson's fleet lying before Santiago, Cuba. He made two hazardous scouting trips ashore for the purpose of identifying and locating the Spanish fleet under Admiral Cervera within the harbor. His mission was successful and he was able to give valuable information to Admiral Sampson. Advanced five numbers for "extraordinary heroism" at Santiago, he served with the Asiatic fleet from time to time until in 1913 when he was first appointed chief of the bureau of navigation. In 1917 and 1918 he was in command of the TEXAS under the British Admiral Beatty.

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Equipment Used Afloat, Ashore

Revolution Counter Developed for Twin Screw Merchant Vessels—Depth Sounding Device Perfected—Determines Depth of Water Under Ship

DUE to the precision with which the navy carries out standardization trials on all of its new ships, the matter of accurately determining the propeller shaft revolutions is of the utmost importance on such ships. Officers of the navy have therefore insisted on having the very best apparatus of this type. The merchant marine, especially in its larger ships, is also having trials conducted which establish a definite relation between the number of the propeller revolutions and the speed of the vessel. Recognizing this fact the Cummings Machine Works, Boston, since 1912 builder of accurate and dependable revolution counters for naval vessels, has now brought out a new two-shaft revolution counter designed particularly for the needs of merchant vessels. A counter of this type has been installed on the new Panama Pacific liner, the S. S. CALIFORNIA.

This counter shows the total revolutions for both the port and starboard shafts and also the average number of revolutions per minute for the two shafts. It also has a two-hand telltale which shows at a glance the actual performance of each shaft, ahead and astern and the proportionate speed of each.

A unique and exclusive feature of this instrument is the revolutions per minute attachment which is especially appreciated by the man at the throttle. It is thus made possible to obtain accurately in one reading the average revolutions per minute of the two shafts. To use this revolutions per minute attachment the counter is set at zero by turning the top knob one revolution which takes but three seconds. When all figures are set at zero the lower knob is pressed for fifteen seconds and the counter indicates the exact revolutions per minute without any calculations whatsoever.

As it is important to know the total revolutions for both directions one-way gears are built in the counter. When the engines are backing the counter continues to add revolutions instead of subtracting, as is the case in the ordinary continuous rotary counter. Since there are ten figures on the unit ring of the counter each representing one complete revolution of the main shaft, the connection outside of the case must be geared down to make one revolution to ten of the main shaft. The instrument is unconditionally guaranteed. It is accurate, as all motion is transmitted by gears fitted with micrometer precision. It is durable as demonstrated by tests under actual service conditions.

Depth Sounding Device

HOW modern science, through the development of electrical echo depth sounding, has solved one of the problems of ocean navigation, is told in the annual report of E. Lester Jones, director of the United States coast and geodetic survey, which has co-operated actively in the perfection of this instrument, known as the Fathometer, with the Submarine Signal Corp., Boston.

Safe navigation, especially in fogs and storms, is dependent upon knowledge of the depth of water beneath the vessel when approaching shore or shallow water. The only practical means of obtaining this information for thousands of years has been to drop overboard a line with a weight at the end. The navigator of the vessel had to be satisfied with the rough measurement made in this way. In recent years it has been discovered that a sound from the surface will be echoed from the ocean bed.

The statments made by Mr. Jones in his annual report, issued only after three years of exhaustive tests, give official assurance that the Fathometer can be considered a practical device. It is in fact now being adopted as standard equipment not only on vessels of the coast and geodetic survey, of the American navy and of the navies of foreign countries, but also on numerous yachts and merchant liners.

The report of the coast and geodetic survey describes the results obtained with the Fathometer in part as follows:

"By means of this echo-sounding apparatus, known as the Fathometer, it is possible without stopping the vessel to take soundings in any depths from a few fathoms under the keel to at least 2500 fathoms (15,000 feet), and probably to greater depths. The advantage of this appartus for survey service is that soundings can be taken as rapidly as desired—as frequently as four per second—with the vessel steaming at full speed. It is, therefore, possible to survey more than twice as much area per day with this apparatus as would be possible by any other means. This apparatus, however, is not confined to the use of the surveyor. In fact, it is of even more value to the navigator since the master of a vessel equipped with an echo-sounding machine can feel his way at night and during stormy weather without stopping the ship. He can also find his position at sea by comparing a series of soundings with the depths shown on his chart and with this information lay out a safe course to his port of destination.

"While the primary purpose of this bureau in going into this subject, and co-operating with a commercial firm in the development of the Fathometer, was to secure an apparatus that would enable the bureau to speed up its hydrographic surveys, it was, nevertheless, influenced by the belief that the perfection of this apparatus would be of great benefit to mariners everywhere and would contribute toward greater safety at sea. I am glad to report that our estimate of this apparatus has been fully justified and that our co-operation has been of material assistance in bringing to perfection a very important contribution to navigation."

A. W. Thompson, president of the Wilson Transit Co., died at Cleveland, Jan. 19. Burial was held in Philadelphia Jan. 23.

Marine Statistics for Jacksonville

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
December, 1927	25	59,744	27	72,636
November	33	72,807	30	74,376
October	26	66,539	24	62,881
September	21	56,916	24	58,165
August	30	77,997	31	86,771
July	26	69,813	27	63,595
June	32	79,910	26	65,919
May	31	73,616	32	70,715
April	23	51,137	21	54,964
March	27	69,984	28	74,495
February, 1927	20	58,004	22	65,791

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Marine Business Statistics Condensed

Record of Traffic at Principal American Ports for Past Year

New York

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
December, 1927....	436	1,770,154	548	2,222,409
November	543	2,243,752	474	2,069,106
October	485	2,105,364	531	2,221,372
September	498	2,153,701	565	2,428,200
August	522	2,179,068	551	2,287,367
July	478	1,910,229	553	2,253,495
June	498	2,093,540	566	2,334,128
May	525	2,167,154	539	2,179,208
April	487	2,048,786	565	2,353,404
March, 1927	460	1,936,478	515	2,074,694

Philadelphia

(Including Chester, Wilmington and the whole Philadelphia port district)
(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
December, 1927....	81	206,171	42	108,935
November	78	193,676	43	99,965
October	94	211,988	63	136,871
September	77	183,481	50	95,898
August	99	235,657	70	153,305
July	83	186,182	53	110,614
June	95	213,122	66	180,861
May	88	196,606	47	86,214
April	86	194,135	52	123,179
March, 1927.....	96	223,255	58	131,147

Boston

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
December, 1927....	91	255,980	52	169,150
November	98	320,340	63	178,707
October	107	380,655	69	244,265
September	114	375,509	83	243,244
August	149	441,819	96	285,255
July	147	401,008	103	326,695
June	155	344,548	99	242,957
May	130	318,196	100	262,982
April	120	343,388	72	201,868
March, 1927	95	301,413	59	187,556

Portland, Me.

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
December, 1927....	23	50,380	23	55,280
November	25	42,291	26	40,248
October	32	60,920	35	71,587
September	32	68,688	32	61,227
August	33	61,873	32	58,949
July	37	62,890	35	55,144
June	24	51,714	25	34,855
May	24	38,244	22	37,246
April, 1927	21	37,182	21	37,114

Providence

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
December, 1927....	4	11,618	5	21,125
November	4	16,374	2	9,920
October	7	24,736	1	2,875
September	4	12,240	4	14,109
August	5	27,235	1	4,035
July	11	37,384	5	17,628
June	3	12,559	5	15,930
May	9	36,882	6	25,950
April	7	28,776	5	18,903
March, 1927	7	26,065	7	25,780

Portland, Oreg.

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
December, 1927....	34	134,562	61	228,472
November	38	141,747	70	247,571
October	57	208,738	70	254,270
September	59	211,182	79	291,920
August	32	117,116	47	157,715
July	31	110,966	35	119,824
June, ...	24	91,554	33	118,631
May	24	86,618	28	98,277
April	31	120,431	44	159,247
March, 1927	21	78,379	31	106,768

Baltimore

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
December, 1927....	129	406,889	132	398,587
November	103	330,488	110	323,666
October	118	365,876	116	350,509
September	116	355,924	130	402,523
August	131	390,713	138	408,083
July	128	384,450	130	368,096
June, ...	125	375,204	125	376,019
May	112	333,395	117	340,274
April	131	409,145	127	377,039
March, 1927.....	120	355,162	117	323,893

Norfolk and Newport News

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
December, 1927....	17	35,439	78	207,636
November	23	51,726	78	206,978
October	25	65,640	77	214,940
September	26	67,249	87	240,899
August	32	71,356	92	222,502
July	42	112,442	77	201,882
June	34	61,041	82	190,228
May	27	56,458	70	179,658
April	23	54,983	77	209,869
March, 1927	32	87,970	98	264,863

Savannah

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
October, 1927	41	119,953	39	112,138
September	36	108,866	40	118,431
August	30	90,063	30	93,030
July	33	96,525	30	87,055
June	27	67,095	30	75,193
May	37	103,549	37	102,757
April	30	87,296	26	108,150
March	37	102,732	39	114,871
February	41	106,385	40	101,633
January, 1927	29	84,029	32	91,974

Key West

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
December, 1927....	103	91,299	101	90,557
November	112	92,152	107	89,156
October	80	87,814	83	88,587
September	69	86,793	72	88,480
August	72	81,247	70	84,132
July	78	84,790	79	84,186
June	84	97,585	85	97,535
May	105	113,030	106	115,564
April	78	79,818	74	75,913
March, 1927	80	91,602	75	93,700

Mobile

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
December, 1927....	75	189,231	73	178,068
November	75	161,528	79	176,885
October	89	210,973	97	237,282
September	80	172,518	89	195,714
August	92	194,609	84	184,655
July	94	198,668	89	190,965
June, ...	97	206,410	84	165,649
May	114	237,650	103	205,876
April	107	240,273	108	218,246
March, 1927	107	217,848	98	197,395

Seattle

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
December, 1927..	56	232,726	58	241,398
November	59	231,003	68	264,841
October	68	268,666	69	272,875
September	62	233,554	58	227,096
August	109	218,218	102	203,902
July	45	183,023	40	162,121
June	38	159,687	39	162,632
May	41	177,869	42	169,083
April	46	186,581	49	185,593
March, 1927	39	159,034	44	175,937

New Orleans

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
December, 1927....	240	671,775	258	714,455
November	226	586,018	236	609,299
October	260	693,720	265	710,922
September	232	613,772	240	632,593
August	276	797,128	265	672,392
July	250	615,826	241	580,228
June	248	606,501	267	750,937
May	277	640,252	269	627,452
April	262	642,846	268	664,467
March, 1927	276	712,619	278	695,933

Charleston

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net. tonnage	—Clearances— No. ships	Net tonnage
December, 1927....	27	65,379	25	63,354
November	32	77,911	33	81,978
October	37	95,473	36	95,070
September	39	102,374	39	101,044
August	39	108,022	35	92,227
July	19	41,460	20	44,633
June	25	67,366	24	62,132
May	26	79,355	24	63,862
April	23	60,557	26	68,555
March, 1927	28	84,155	31	85,476

Galveston

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
December, 1927....	34	79,353	51	142,779
November	43	103,885	66	179,841
October	69	184,154	99	290,370
September	70	200,573	97	301,105
August	76	214,876	95	274,670
July	77	204,961	93	260,431
June	67	173,331	75	199,410
May	80	218,443	101	281,221
April	63	179,757	88	265,159
March, 1927	84	247,873	98	307,155

Los Angeles

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
November, 1927....	248	507,775	185	429,101
October	266	573,090	202	489,442
September	238	488,416	282	441,184
August	160	483,069	214	473,702
July	121	452,983	106	407,695
June	178	484,561	125	418,967
May	161	470,471	138	456,885
April	179	477,762	173	441,374
March	156	451,428	165	442,022
February	144	418,190	144	404,758
January, 1927.....	137	420,426	138	381,692

San Francisco

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
December, 1927....	171	665,944	158	631,872
November	139	538,160	135	578,466
October	173	630,193	162	607,386
September	168	600,454	152	559,684
August	176	636,152	150	583,653
June	154	556,225	140	526,976
May	148	545,414	137	510,560
April	141	531,380	137	518,577
March	145	555,324	148	586,354
February, 1927	147	561,214	138	513,253

Port Arthur

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
December, 1927....	23	67,105	21	68,602
November	21	64,277	25	80,084
October	18	50,632	25	82,177
September	16	51,492	29	83,728
August	22	58,352	27	78,652
July	21	61,871	34	102,998
June	16	44,565	26	92,198
May	15	46,223	28	83,926
April	26	57,645	40	107,757
March	20	47,739	23	58,802
February, 1927	34	80,063	31	84,324

Note: The figures given in this table are for direct entrances and clearances. Additional vessels in foreign trade enter and clear from and to other American ports after original entry and before final departure. At the port of Philadelphia, for instance, additional vessels in the foreign trade in this category were 74 of 239,843 net tons entered and 100 of 316,683 net tons cleared for the month of December.

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To Build Car Floats

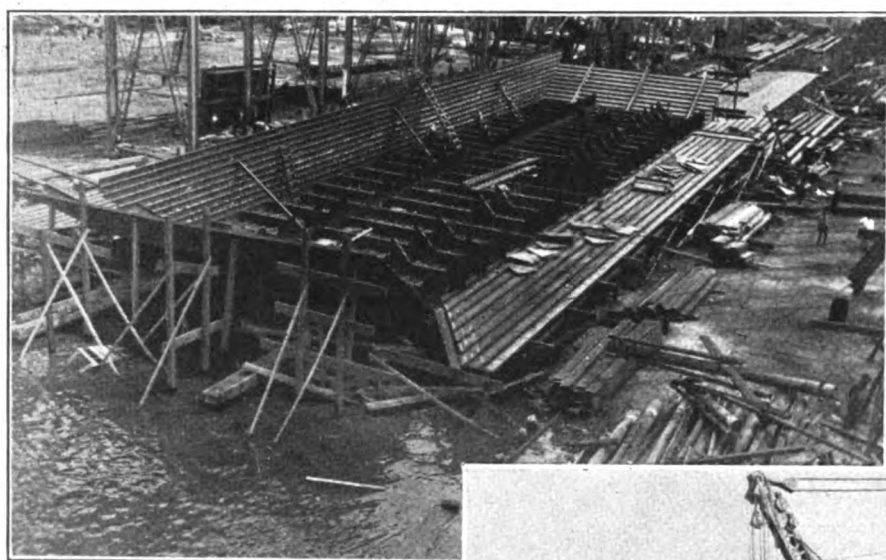
Contracts were to be placed by the Pennsylvania railroad, during the latter part of January for 15 vessels on which bids were opened, Jan. 13. These include six 330-foot car floats, six 250-foot car floats, two tugboat hulls and one steam lighter.

Delaware river shipbuilders are also interested in the four car floats and some miscellaneous craft for which the New York Central railroad is in the market.

It is reported that the Pocahontas Fuel Co. is interested in bids on two colliers. No details have been made public but it is expected that the lead of the Berwind-White Coal Mining Co. will be followed in having the vessels equipped for burning pulverized coal. It is understood that the latter company will seek new bids on modified specifications.

Mighty Derrick Barge Enters Service

THE MERRITT CHAPMAN & SCOTT CORP., New York, recently placed in commission a seagoing derrick barge known as the MONARCH which is, as far as known, the largest seagoing floating derrick in the world. This vessel was built by the Newport News Shipbuilding & Dry Dock Co., Newport News, Va., on the patented Ellis channel system of hull construction. The dimensions are: length overall, 156 feet; breadth overall, 52 feet; depth molded, 13 feet.



DERRICK BARGE MONARCH UNDER CONSTRUCTION

The vessel is designed for a maximum over the side boom lift of 300 tons. The owner, in view of the watertight interior subdivision of the vessel, intends to eventually devise a ballasting system which will give a lift of 600 tons. The design was prepared by W. G. Esmond, naval architect, for the Ellis channel system, and by A. Sieke of the Merritt Chapman & Scott Corp., under the direction of D. Bailey, manager of the marine department of that company.

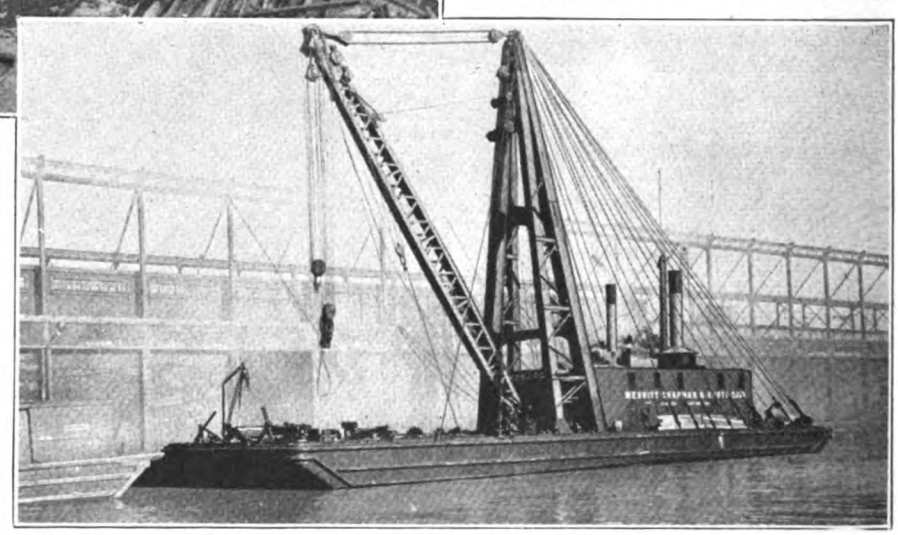
Several designs embodying plate and shape construction were also considered, but it was decided, after a careful study that the channel system would provide a cheaper hull in view of the great strength required.

Delivery was made of the completed hull by the shipyard. The hoisting machinery, A frame and boom were provided and installed by the owners. Portions of the old MONARCH were utilized after having been modified to make them suitable for the larger lifting capacity of this vessel. Transverse and longitudinal bulkheads of channel construction divide the hull into 19 watertight compartments. There are three longitudinal watertight bulkheads running the full length of the vessel and three transverse watertight bulkheads extending completely athwartship. Partial watertight bulkheads forming the boundaries of ballast and fresh water tanks also of channel construction.

In addition to the water ballast tanks having a total capacity of about 300 tons, provision is made for carrying about 150 tons of fresh water for boiler feed, sanitary and other services and 170 tons of coal. Specially designed foundations were provided under the A frame legs and boom heel, in order to distribute the various stresses occasioned when lifting heavy loads over as large an area of the vessel as possible.

A large steel deck house, housing the hoisting engines and boilers, pumps, generators, crew's quarters and galley is located at the after end of the vessel. The mooring and other deck fittings of cast steel are of specially heavy design, as provided in the owner's requirements and patterns.

Provision has been made for pumping and filling each compartment by means of two special pumps located in the engine room. The manifold controlling these operations also is located in the engine room.



POWERFUL DERRICK BARGE MONARCH AFTER COMPLETION IN NEW YORK

The entire shell, deck, transverse and longitudinal bulkheads and transverse framing are formed of structural steel channels, those of the shell, deck and framing being of 18-inch, while those of the transverse and

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fore and aft bulkheads are of 12-inch. The channels in both transverse and longitudinal bulkheads were laid horizontally in order to better resist the bending and twisting stresses set up in vessel's structure when boom is lifting the maximum load.

Wide spaced framing of 18-inch structural steel channels is continuous across bottom and deck and up sides, slotted out in way of flanges of shell and deck channels and riveted to webs of each shell channel. The flanges of the shell and deck channels are secured together by ⅞-inch diameter wide spaced rivets. This riveting was done by a compression or bull riveter which exerted a pressure in excess of 60 tons per square inch when driving each rivet.

As in all hulls of this type of construction, the great pressure of bull riveting brings the flanges of the shell and other channels in absolute contact. No caulking at the heels of the shell is necessary as the hull is watertight without. One of the features of this system of construction, in addition to the great strength that it affords, is that only about 25 per cent of all rivets used come in contact with water and air, consequently replacements due to corrosion are reduced materially, with a reduction in cost of maintenance. Bull driven rivets also absolutely fill the holes and so they will not work loose during the life of the vessel, and the designed strength of the vessel can always be counted upon.

The punching of the flanges of the channels was done in an ordinary horizontal punching machine, converted by a simple change into a double stroke machine, while the holes through the webs were punched in a vertical punching machine having multiple punches. After the channels were assembled on building blocks and bolted up, practically no reaming was required, testifying to the accuracy of the work done.

The plans for the fabrication of all material entering into the construction of the barge were developed in great detail by the Newport News Shipbuilding & Dry Dock Co. by W. Sparrow under the direction of H. F. Norton, naval architect. Mold loft work and templates were practically eliminated by the completeness of the drawings issued.

All compartments of the hull were tested before launching by filling with water and were found perfectly tight. No caulking was needed at the heels of any of the shell, deck, and compartment boundary channels.

Owners Offer Merchant Marine Policy

BY LYNNE M. LAMM

SHIP owners and operators meeting in Washington Jan. 11, with the United States shipping board, concluded their sessions by adopting a resolution submitted by a committee headed by H. B. Walker, president of the American Steamship Owners' association, recommending congressional legislation to permit the development of the American merchant marine under private ownership. The conference went on record as favoring the Copeland bill in the senate and the Wood bill in the house. The latter bill was discussed in the January issue of MARINE REVIEW. A minority report was signally defeated, having been presented by Malcolm Stewart, chairman of the Middle West foreign trade association. Andrew Furuseth, president of the American seamen's union went on record as opposing both the majority and minority reports.

The owners and operators were here at the request of the shipping board, the latter having in December adopted the following resolution in this connection:

"Resolved, That in order to bring about a clearer understanding of the position of the private steamship interests and for the purpose of obtaining advice and suggestions affecting the upbuilding of our merchant marine in hope of more nearly composing the different ideas on this problem so vital to the public welfare, the chairman is hereby authorized to request the American steamship owners on the Atlantic, Gulf, Pacific and Great Lakes to send a representative for the purpose of conferring with the shipping board in a free and full discussion of this matter, the hearings to commence January 10, 1928."

The full text of the majority report adopted by the conference follows:

Whereas, representatives of American steamship and trade associations and allied interests, in conference with officials of the United States shipping board, at Washington, D. C., this eleventh day of January, 1928, desire to place on record the following brief analysis of conditions at present surrounding the American merchant marine.

Public Interest Is Evident

We deem it to be an axiomatic truth, evidenced by executive pronouncements, acts of congress and otherwise, that the people of the United States are desirous of possessing a merchant marine fully able to handle the greater portion of the country's water-borne commerce and also to serve as a naval auxiliary in time of national peril.

In order to appraise the present shipping situation, it becomes necessary to consider the existing merchant fleet under its two grand divisions: First, that part engaged in the purely domestic coastwise and intercoastal trades; second, the overseas or strictly foreign services.

The coastwise and intercoastal trades are restricted by law to vessels built in the United States and owned and operated by citizens thereof. This being an exclusively American industry, protected from foreign competition by our beneficent coastwise laws, it shares in the general prosperity of the country and constitutes one of the largest and finest shipping services in the world.

Status of Overseas Fleet

In a different status is the overseas fleet, organized largely since the war and operated with war-built ships, most of them under the control of the shipping board. Exposed to competition with faster and more modern vessels launched during the past few years by our foreign shipping rivals, this portion of the American merchant marine operates at a great disadvantage when compared with the coastwise fleet.

Practically all American vessels engaged in foreign trade were designed before the advent of the fast modern "motor-ship," whereas the freight and passenger vessels which are being turned out so rapidly from the English, German, Italian, French, Scandinavian and Japanese yards constitute the new and speedier type.

A report of the conference held in Washington, Jan. 10-11, by various American steamship owning and trade associations with the United States shipping board for the purpose of recommending measures intended to help in upbuilding an American merchant marine in foreign trade. The author, Lynne M. Lamm, is Washington correspondent for MARINE REVIEW.

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It is well to note that fully 50 per cent of the vessels now under construction throughout the world are motor-ships. This, of course, means that unless present conditions are changed American ships will handle a constantly decreasing share of our vast overseas trade and will lose all hope of securing the profitable freight and passenger business.

The original theory underlying our recent national shipping operations was that the government should use its war-built merchantmen in establishing steamship service on routes essential to American commerce, and should then dispose of these services to private American capital. The advent of the motorship, coupled with differentials in operating costs, due in great measure to different standards of living, has tended to make the purchase of the government's lines so unattractive from an investment standpoint that of the 35 lines established by the shipping board only ten have been sold.

Although efforts are being made to remove some of the existing handicaps by converting a number of the government's vessels into motorships, the process is a slow and costly one and thus far has been applied to only a few ships. The net results of these operations may be summed up by saying that while the converted vessels show a gratifying decrease in operating costs, the gain in speed is negligible and in no sense offsets the fast service furnished by our foreign competitors with new ships of modern type designed for specific trade routes.

Fleet Is Becoming Obsolete

The present situation admits of no misinterpretation. Our overseas merchant fleet is becoming obsolete by the rapid march of science and invention, which has completely revolutionized the manner of vessel propulsion since our ships were built. In the absence of a replacement and reconditioning program, early transfer of a substantial part of the remaining ships to private ownership, with reasonable assurance of continued operation, is unlikely.

In these circumstances but two alternatives present themselves. One is to modernize the fleet. The other is to retire from the seas. The most vital national interests are involved, to say nothing of an annual ocean freight bill exceeding $700,000,000.

We believe that the shipping board, in the face of serious obstacles, has done its best to carry out the merchant marine act of 1920. But we further believe that a crisis has been reached and that the future of the American merchant marine now depends upon prompt constructive action by congress.

This action should look toward reconditioning some of the present fleet, and should otherwise provide inducements having in view its early transfer to private ownership under conditions assuring continuance of operation. Whatever congress may do along this line will be unavailing unless it provides a way by which private American citizens will be enabled to own and operate modern ships in the ocean-carrying trade of the world in competition with citizens of the other great maritime nations.

Now, therefore, with due regard to the exigencies of the shipping situation as above set forth, be it

Resolved, that this conference indorses the general principles and policies embodied in the bills at present pending in congress known as the Wood bill (H. R. 2) and the Copeland bill (S. 2036); and

Resolved further, that we recommend that the principles and policies contained in the main provisions of the above-mentioned bills be enacted into law, and to that end, that the shipping board furnish such information to congress and make such reasonable effort to procure amendments and modifications as may be necessary to provide such adequate aid as will assure the United States' having a successful, permanent American merchant marine under private ownership; and

Further resolved, that we recommend that the shipping board lay before congress full information concerning the character and number of new ships which in its judgment should be constructed in American shipyards to modernize the services now operated by the board.

The President's Policy

Message to Congress, Dec. 6

"The United States government fleet is transporting a large amount of freight and reducing its drain on the treasury. The shipping board is constantly under pressure, to which it too often yields, to protect private interests, rather than serve the public welfare. More attention should be given to merchant ships as an auxiliary of the navy. The possibility of including their masters and crews in the naval reserve, with some reasonable compensation, should be thoroughly explored as a method of encouraging private operation of shipping.

"Public operation is not a success. No investigation, of which I have caused several to be made, has failed to report that it could not succeed or to recommend speedy transfer to private ownership. Our exporters and importers are both indifferent about using American ships. It should be our policy to keep our present vessels in repair and dispose of them as rapidly as possible, rather than undertake any new construction. Their operation is a burden on the national treasury for which we are not receiving sufficient benefits."

Chairman O'Connor Presides

Opening the sessions, the chairman of the board, T. V. O'Connor, expressed his appreciation for the attendance, and then related the reason for calling the conference. Emphasizing that congress has placed upon the board "full responsibility for carrying out the national policy relating to the merchant marine," he said there was too much conflict as to whether the merchant marine should be privately owned or government-owned. "As a matter of fact," he said, "I have found nobody who is not in favor of an American merchant marine, but it is evident that while we are fussing about who will hold the reins the horse is starving.

"We all have a desire to carry out the act and to transfer the ships to private capital as soon as that can be done on a permanent basis. There are several bills pending in congress at the present time. They are aimed to facilitate this transfer and to make permanent the present lines."

Permanency Is the Keynote

"Permanency of operation," Mr. O'Connor said, "is the keynote of our deliberations." This, he said, is agreed to by all friends of the American merchant marine, "irrespective of whether title to the ships rested in American citizens or in the American government." The board, he explained, has sold something like 1134 ships, representing nearly 5,000,000 tons, for more than $84,000,000, "and yet in all these hundreds of transactions it has never sold an established line except under the reasonable certainty that such sale, with a guarantee period, would carry out the idea which I have suggested as the keynote of this conference, namely, permanency of operations."

H. B. Walker, president of the American Steamship Owners' association, presented to the conference the recommendations of his organization for the permanent establishment of an American merchant marine. He explained that his organi-

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zation's conclusions were endorsed by the Pacific Steamship association, and by the Shippers association of the Pacific coast.

Opening his remarks, he said that in its major phases the problem of placing American shipping in foreign trade on a permanent basis involves the following general considerations: (1) Replacement of obsolete and worn out ships; (2) meeting the differentials in operating costs; (3) retirement of the government from the shipping business; and (4) amendment of the navigation laws to make them no more burdensome than the laws of other maritime countries."

Relating to the retirement of the government from the shipping business, Mr. Walker said:

"If conditions generally are brought about in the shipping business so that the differentials in operating costs can be met, and replacements can be had at costs on a parity with the costs of building in foreign yards, then unquestionably a number, if not substantially all, of the services now being operated by the shipping board can be sold and the government retired from the shipping business."

Jones Bill Is Favored

The government, he said, "also should retire from the operation of navy and army transports, whenever, in the judgment of the President adequate transportation facilities are afforded by privately owned vessels." He said that the association approves the bill (S. 1608) introduced by Senator Wesley Jones (Rep.), of Washington, chairman of the senate committee on commerce, which is designed to remedy this situation. He also pointed out that the large laid up fleet of the board "has had a deterrent effect upon American steamship owners in the purchase of the present services operated by the shipping board, and that the association "believes that these should be disposed of."

H. G. Smith, of the Bethlehem Shipbuilding Corp., representing the national council of American shipbuilders, told the conference that the shipyards of the country are in "a very bad" situation, and much worse than is generally supposed. He said that an analysis recently made showed that only two ships per yard have been built in the five shipyards now in operation during the past several years. Shipyards, he said, have closed down one after another, declaring that their fate is inevitable, unless work is provided for them. The conference did good it was felt.

Tanker Robert W. Stewart Is Launched

ON DEC. 3, 1927, an unusual and interesting vessel for Great Lakes service was launched at the Lorain yard of the American Ship Building Co. This was the tanker, ROBERT W. STEWART being built for the Standard Oil Co. of Indiana. Constructed on the Isherwood system of longitudinal framing, she is fitted with seven double main cargo tanks, each 30 feet long, having a combined capacity of 2,000,000 gallons. There are two cofferdams and a fuel oil bunker with a capacity of 330 tons. The pump room is forward. A double bottom is fitted only under the engines and boilers. Cargo tanks go to the skin of the vessel.

Accommodations for deck officers are provided for in the texas on the forecastle deck and in the forecastle. The engineer officers and crew are quartered in the after deckhouse.

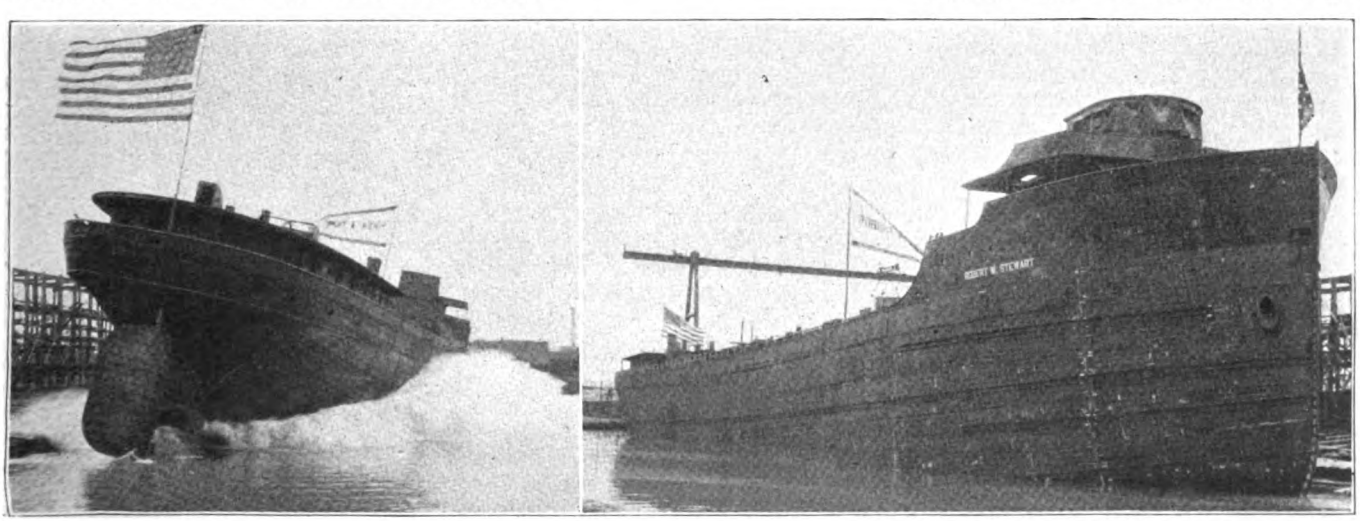
There are two steel masts, each fitted with 40-foot booms and provided with the usual running rigging for handling suction hose, stores, and odd cargo.

A fore and aft gangway extends along the center line from the forecastle to the after deck house fitted with life lines and stanchions. The steam and exhaust lines, telemotor tubes, whistle pulls and electric conduits are brought forward on this bridge.

The general dimensions are as follows:—Length over all, 390 feet 5 inches; length between perpendiculars, 380 feet 3 inches; beam molded, 52 feet 0 inches; depth molded, 25 feet 0 inches; load draft, 19 feet 0 inches.

The propelling machinery consists of one vertical triple expansion engine with diameter of cylinders, 23½ x 38 x 63 inches and with a common stroke of 42 inches. The high pressure cylinder has a separate hard cast iron liner, and steam is admitted through a piston valve. Both intermediate and low pressure cylinders are fitted with double pivoted slide valves with relief frames. Valves for the cylinders are connected to Lovekin assistant cylinders. All valve gear is operated by the Stephenson double bar link type of the over hung style.

The columns are arranged three in the back with slipper guides water cooled and four in front all of cast iron. The bedplate is of box girder section with four bearings fitted with Parsons white bronze to suit 12½-



TANKER ROBERT W. STEWART, LAUNCHED DEC. 3, 1927 AT LORAIN, O., BY THE AMERICAN SHIP BUILDING CO.

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inch diameter crank shaft. A built up type of crank shaft is used made of forged steel and cast steel crank webs, with the shaft increased in webs.

Pistons are of the box type and are all fitted with C. Lee Cook's packing rings made of graphitic iron. The operating gear is located on the starboard side of the engine at the main deck level.

A surface type of condensing apparatus is being installed, with air jets and condensate pump. The condenser is supplied by a 12 inch circulating pump and is also connected to one of the reciprocating pumps. This is a comparatively new feature for Great Lakes ships. All feed water is taken from the feed and filter tank in which is utilized all possible heat from exhausts and drains.

The propeller is of cast iron of sectional type, 14 feet 10 inches in diameter by 14 feet 4 inches in pitch.

Boilers Are of Scotch Type

Steam is supplied by two boilers of scotch type, 15 feet 4½ inches in diameter and 11 feet 6 inches long inside of heads. Each boiler has three 46 inch inside diameter Morrison suspension furnaces. The boilers are built for 180 pounds working steam pressure to Lloyd's and United States steamboat inspection rules. The tubes are 2¾ inches in diameter and are of charcoal iron. In design and construction these boilers represent the best modern practice for their type. Oil is used as fuel and the Todd system of oil burning is being installed.

The steering gear is of the American Ship Building Co.'s direct geared type and is operated by hand and steam aft, and by steam forward by means of steel shafting in roller bearings. The windlass is of American Shipbuilding Co.'s spur geared type, and uses 2⅛ inch anchor chain. There are two steam driven duplex cargo pumps, 15 x 11 x 18 inches, located in the forward pump room. There is also one 7 x 6 x 10 inches duplex drainage pump located in the forward pump room and a 6 x 6 x 6 inches bilge pump in the same location. A steam driven fan is fitted in the forward pump room for blowing out gases, from this space.

In the engine room there is a duplex ballast pump 16 x 10 x 14 inches, which is also used for fire purposes. The feed system consists of one 12 x 7 x 12 inches duplex main feed pump and one 12 x 7 x 12 inches duplex auxiliary feed pump. Two injectors are also fitted for port use.

The sanitary system is laid out in conformity with the usual lake practice. A 6 x 6 x 6 inches duplex horizontal sanitary pump, fitted with a governor set at 45 pounds furnishes all the necessary sanitary water supply. Hot water is supplied by two hot water tanks, one forward and one aft.

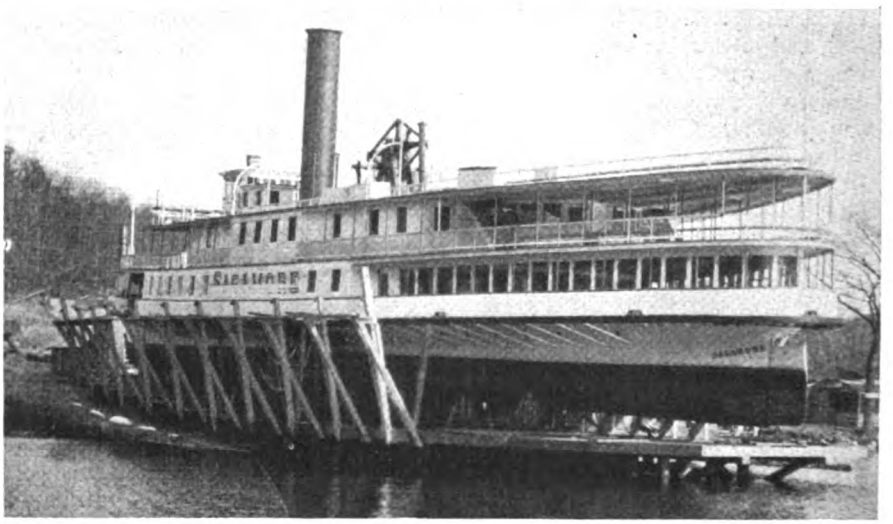
Drinking water is furnished by a Griscom-Russell distilling apparatus of 50 gallon per hour capacity. The distilled water is drained through the distiller into a tank, from which the drinking water pump delivers it to a tank on the upper deck. From the latter tank drinking water is then supplied to the faucets and drinking founts by gravity.

The main engine has no attached pumps. The air pumps are of the steam jet type and a separate 6 x 6 x 6 inches bilge pump is fitted in the lower engine room.

For light and other purposes there are two 15-kilowatt generators located in the engine room. There is also a two-ton steam driven refrigerating machine with ice making tank and coils to the meat and vegetable room.

There are six American Ship Building Co.'s 8 x 10 inches deck engines. All steam, exhaust, and water pipes, also all electrical conduits run under the fore and aft gangway. Pipes are fitted with expansion joints and expansion bonds. The vessel will be a fine modern steam oil tanker.

Build Railway Drydocks



Recently Completed Railway Drydock at Baldwin Landing, Lake George, N. Y.

PRIVATE steamship operating companies have found under certain conditions that it is a good paying proposition to have under their own control and at a convenient location some adequate means of drydocking or hauling out the various units of their fleet. In two instances recently the Crandall Engineering Co., Boston, has been called in to design and build an appropriate railway drydock to meet such requirements.

The accompanying illustration shows the new railway drydock recently completed for the Lake George Steamboat Co., Baldwin Landing on Lake George, N. Y. A test load consisting of the steamer HORICON was successfully hauled last November.

The Lake George Steamboat Co. had been contemplating for some time the installation of a modern type of drydock to replace their old building ways on which the three steamers now on the lake were built and which were used as the only means to haul out these vessels when they needed repairs. It was found that it cost from $3000 to $4000 to haul out each vessel on these old greased building ways and required from one to six weeks to get the vessel out and to put it back again into the water. The cost of doing the same work on the new railway is less than $30, thus saving almost the entire cost of the previous hauling and cutting down the time element to about one hour.

On July 6 last, the steamer SAGAMORE in making its run one exceed-

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ingly foggy morning from Baldwin landing to Lake George, struck a ledge which tore away the fore-foot, causing the boat to fill rapidly. In spite of the dense fog, the boat was beached but the after end sunk with about 8 feet of water over the main deck. The boat was successfully raised but it was clearly evident that if she was to be saved, it was necessary to get her out of water. Consequently, it was decided to go ahead with the building of a railway drydock on the site of the old building ways. The contract was closed with the Crandall company about Aug. 1 and the work was started immediately. It was completed in 3½ months or about one month ahead of the time scheduled.

Lifting Capacity 800 Tons

This new railway is of the standard type, built by this company, who has specialized in the design and construction of drv docks for over 70 years. This railway has a capacity of 800 tons actual weight with a keel block length of 190 feet and a clear breadth of 60 feet. It is of timber construction excepting the main deck beams which are of steel girders on account of the great width necessary for these side wheel steamers. It is powered with a standard steam hoist and manganese steel hauling chain.

The three steamers of the Lake George Steamboat Co., the HORICON, SAGAMORE, and MOHICAN are the only vesse's on Lake George, which is entirely land-locked and whose water level is nearly 250 feet above Lake Champlain. Except in case of accident, it is expected that these boats will need docking only about once in two years. It is believed that the economy of operation, and low maintenance cost, of this railway drydock will considerablv reduce the cost of repairs and upkeep of these steamers.

A second interesting instance of a steamship company deciding to install means for drydocking its own vessels is the case of the Lago Oil & Transport Co. who contracted with the same company for the construction of a railway drydock of 2100 tons actual lifting capacitv at San Nicholas bay, Aruba, D. W. I.

This drydock is a part of the project of the Lago Oil & Transport Co. in establishing at San Nicholas bay a station for the storage of oil from its wells in Venezuela, for reshipment to various parts of the world. A fleet of fifteen 300-foot light draft tankers bring the oil out from Lake Maracaibo, Venezuela and bring it to the station at San Nicholas bay. There these tankers dock alongside of a new 1000-foot concrete pier and pump the oil to large storage tanks or into large ocean-going tankers. San Nicholas bay has been transformed into a fine sheltered harbor with deep water and a 30-foot entrance channel, recently completed.

In order to drydock these 15 tankers, it has hitherto been necessary to send them to the United States government dock at Balboa, C. Z., or to the British dock at Trinidad. Either place is at a week's steaming distance. This not only entails a large fee for docking and repairs but also a loss of fifteen days per vessel in order to get two days' drydocking for cleaning and painting. With the new drydock, the fees for drydocking and repairs will not only be considerably smaller but the lost time cut from fifteen days to about two days for each vessel.

The railway drydock is designed especially to take care of this fleet of 15 tankers. It is to have a lifting capacity of 2100 long tons with a keel block length of 300 feet and a breadth of 60 feet. The underbody of the cradle will be of steel construction and the upper part of timber construction. The track will be of protected timber construction on a foundation of piling and concrete. It will be powered by a standard Crandall railway hoist and manganese steel hauling chains, capable of hauling out a capacity load in less than thirty minutes.

Singapore Naval Dock Is Completed

As floating dock designer and builder there are some fine achievements in rapidity of construction already to the credit of Swan, Hunter & Wigham Richardson Ltd., Wallsend-on-Tyne, who has completed more floating docks than any other firm in the world. First place however, will be taken by their latest performance in building the immense 50,000 ton floating dock for the British admiralty for the new Singapore naval base, in about ten months from the laying of the first plate to the launching of the last of the seven sections.

The Singapore dock contains about 20,000 tons of steel. The delivery of the steel began in January and was completed by July. The first section was launched July 15. Three of the sections had to be launched before the remaining four sections could be erected on the berths. In all 3,500,000 rivets were used in the structure of this dock. The inside of the dock is sufficiently long so that the MAURETANIA can sit comfortably inside with 30 feet to spare at bow and stern.

S. S. Dixie Enters Service

THE DIXIE is unique among American ships for engineering innovations introduced by A. S. Hebble. Having had complete success with rather higher than usual steam pressures and superheat on other recently completed vessels for the line he decided to carry these ideas further on the DIXIE. We believe her steam pressure is 350 pounds and that her fuel consumption per shaft horsepower per hour will be about .70 pound. The new vessel will consequently have an exceptionally high standard of operating efficiency and economy. The turbine machinery and reduction gears were furnished by the De Laval Steam Turbine Co. and are of high engineering repute.

Every safeguard possible has been thrown about passengers and crew. The vessel is equipped with wireless, lifeboat equipment of the most modern type for all passengers and crew. Special attention has been devoted to insure the prevention, detection and control in case of fire. For this purpose there are steel decks, steel fire screen bulkheads and steel doors and passage ways, fire proof partitions, ceilings and paneling, an automatic fire detector system, CO_2 fire extinguishing system and manual alarm system.

A broad promenade deck extends all around the passenger quarters wide enough for deck chairs and leaving comfortable space for promenading and exercising. The forward end of this deck is enclosed with sliding glass windows extending aft on each side for a distance of 75 feet. American colonial design has been adopted in the decorative scheme and furnishings of passenger quarters. Social halls as well as passenger cabins are fitted out to give an atmosphere of comfort and luxury. There are accommodations for 279 in first cabin and 100 in third class. First cabin passenger accommodations are all well ventilated outside rooms supplied with both hot and cold running water and cold drinking water.

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Personal Sketches of Marine Men

Ancil F. Haines, Vice President, Pacific Steamship Co. and Admiral Oriental Line

By Robert C. Hill

THROUGH years of practical experience he has gained intimate knowledge of the details of successful ship operation. He believes in the ability of Americans to profitably engage in shipping.

TO HIM the Orient, with its vast population and immense rich undeveloped resources, presents the most fertile field for future trade expansion. American ships are indispensable in this development.

UNDER his executive control is a fleet of American express passenger and freight vessels, the finest under any flag on transpacific routes. A constantly growing business is being built up.

FOLLOWING the advice of Horace Greeley, Ancil Foster Haines turned his eyes westward and although he has been a prominent citizen of Puget sound for 37 years his eyes are still turned toward the setting sun.

In other words, Mr. Haines, now one of the foremost executives engaged in operating steamships between this coast and the Far East, believes that the teeming millions of the Orient furnish the most promising field for the development of American foreign trade.

Robert Dollar, the dean of the American merchant marine, has frequently predicted that the center of the world's shipping in the future will be in the Pacific. Once the Mediterranean held this honor, for years the Atlantic has held the limelight. Sensing the definite shift of the world's commerce westward Captain Dollar visions the Pacific as the future beehive of commercial activity. Mr. Haines, a close student of Oriental trade, is firmly convinced that Captain Dollar's prophecy will be realized within a few years as China becomes more stabilized.

Knows Oriental Trade Practice

Mr. Haines is vice president of the Pacific Steamship Co., also vice president of the Admiral Oriental line, operating five express passenger and freight liners for the American Mail line and seven modern freight steamers for the shipping board under the name of the American Oriental Mail line. For many years he has been known as one of the foremost advocates of the American merchant marine, while his intimate knowledge of rates, shipping practice and the Oriental trade has brought him well merited recognition in commercial and maritime circles in all parts of the United States.

Like many other shipping executives on this coast Mr. Haines comes from the interior where little is known of the great commerce carried on the high seas. If the Pacific coast has gained a shipping executive of superior knowledge and renown, the state of Ohio lost a potential farmer who would have made a success in agriculture if for no other reason than his love of hard work.

Began in Railroad Transportation

Born in Champagne county, Ohio, in 1871, the subject of this sketch in his very early years formed a close acquaintance with both labor and prayer, the former because he was brought up on a farm and as to prayer—this was inculcated by a great uncle of strict Quaker stock who took charge of the boy when the latter's father died. The result of these influences on his early life is that Mr. Haines has been a living example of one who believes in and practices hard work.

One day on his uncle's farm, while doing a first class job of plowing, the young man watched a brakeman walking the roof of a string of freight cars on the Erie railroad, close by, and thereupon he received the inspiration to enter the transportation business, an ambition which carried him over many rough spots in his career before he began to climb the stairs of success.

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His boyhood was spent alternately on the farm and in school at Ada, O., where he finished a course in shorthand. Eventually he landed in Cincinnati and obtained a position with the Cincinnati, New Orleans & Texas railroad. T. C. Powell, then chief clerk, later vice president of the Southern Pacific, gave him his first transportation job. He advanced steadily in railroad work until the call of the West caused him to become restless. This was due to a flamboyant poster concerning Tacoma, Wash., which was advertised as the "city of destiny". This was the turning point of his career.

Burning his bridges behind him, he arrived in Tacoma in March 1891 and found a position as stenographer with the Northern Pacific railroad. He was assigned to the water division which had charge of operating the railroad's fleet of steamers in Puget sound and British Columbia waters. For six years he remained with the railroad advancing to city passenger agent.

At this time, Puget sound was getting its first contact with Oriental ports and Mr. Haines, divining that this commercial route was destined to marvelous development, decided to change from land to water transportation. Consequently in 1897 he joined Dodwell, Carlill & Co., now Dodwell & Co., agents for lines operating to the Far East. He advanced to general freight agent in Tacoma until in 1912 he was transferred to Seattle as manager. Since then he has made Seattle his home.

In addition to handling a regular steamship service to Japan, China and the Philippines, Mr. Haines managed his company's other activities including the Dodwell Dock & Warehouse Co. and the Border line, operating to British Columbia and southeastern Alaska.

American Ships to the Far East

In 1916, Mr. Haines joined the Admiral line as manager. At this time, H. F. Alexander had doubled the Admiral fleet by taking over the Pacific Steamship Co. Mr. Alexander visioned the opportunity of developing an American fleet of steamships in the Oriental trade. Naturally he selected A. F. Haines as the man best fitted by knowledge of Oriental conditions to work out the details of this new service.

This opportunity fitted in nicely with Mr. Haines' ideas. When with Dodwell & Co. he had handled nearly all foreign flag tonnage on the transpacific route. He had always been a strong advocate of an American merchant marine and it was with enthusiasm, born of hope long deferred, that he bent to the task of shipping American goods in American ships to the ports of the Far East.

For several years steamers none too well adapted for overseas trade were used but high freights and lack of space gave the line an impetus. At the close of the war shipping board tonnage was allocated to take care of the business which had been inaugurated and since then, foreign shipowners have found the American flag a worthy competitor for the carrying of commerce on the transpacific berth. Mr. Haines is now executive vice president of the operating company and in that position he has not only organized an efficient staff in the various Oriental ports of call but has developed a steady stream of freight in both directions that has given his ships prestige here and in the Far East.

In 1921, when the Admiral Oriental line was allocated, the five express passenger and freight steamers built by the government, his vision was realized. Thus was established under the American flag the finest line of vessels in the transpacific routes. In previous years spasmodic service under the American flag had been furnished but practically all passenger traffic from Puget sound was handled by foreign steamers. With a ten-day voyage between Seattle and Yokohama, in steamers de luxe, the finest on the Pacific, Mr. Haines at last was in executive control of such a fleet as he had vainly hoped for in years past. Since 1921, it has been his life's work to build up business for this fleet and the success it has since attained is a tribute to his foresight, his executive ability and the hard work of a loyal and efficient organization. The shortest route to the Orient, through Seattle, has appealed to the traveling public as attested by the increasing passenger travel handled by the American Mail line in its splendid vessels on this route.

For years Mr. Haines has been a strenuous advocate of means and methods whereby the interests of the American merchant marine may be advanced. He believes the American business man should buy in foreign countries on a f.a.s. basis and sell export goods c.i.f. In other words he stresses the fact that by following this plan, Americans can dictate the ships in which their goods are carried and naturally they should prefer American bottoms. He has frequently pointed out inconsistencies in some of the United States archaic marine regulations which hamper American vessels and increase the costs of operation. He is a source of information on water traffic problems and is always willing to assist in any way the development of overseas traffic.

In public life, Mr. Haines has given freely of his time and service. He has been active in the affairs of the Seattle chamber of commerce, especially in matters of foreign commerce and transportation problems. He is past president of the China club and the Seattle Transportation club and has been active in the affairs of the Japan society of Seattle. These organizations have made full use of his vast store of knowledge in matters of overseas commerce and foreign trade and have benefited in a large measure accordingly.

His hobby is ships and work, then more work. As a diversion when no more work is immediately at hand, he enjoys a few brief hours on the golf course.

In addition to being an outstanding figure in the transportation world, Mr. Haines has another distinction of which he is equally proud. He is the head of a family of ten fine children, eight daughters and two sturdy sons. Last December Mr. and Mrs. Haines celebrated their twenty-fifth wedding anniversary. This was coincident with his retirement from the presidency of the Transportation club the members of which testified their appreciation of his services by giving him a silver set.

Believes in an American Marine

"I believe in the American merchant marine," said Mr. Haines recently. "I believe that we can operate ships on the high seas in competition with other nations. To deny this statement is to cast a shadow over American achievement in every other field. Of course, as a nation, we are not ship minded to the degree that the importance of our commerce warrants. However, the people of this country are coming to a realization that adequate water transportation is a vital necessity in times of peace as well as in war. We should be prepared on the high seas for any emergency. There are many laws which should be modernized but if we work along the right lines. I am sure that we will eventually have a permanent merchant marine which will not only be a credit to the nation but a source of both profit and safety as well. We must have adequate tonnage on the high seas."

From plow boy to active executive of one of the finest fleets of ships plowing the high seas—how can it be said there is no opportunity today for the poor boy. The career of Ancil F. Haines proves that faith will remove mountains and that hard work brings its rewards.

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Great Lakes Losses

The season of 1927 on the Great Lakes showed a greater loss of life and property than in 1926. No less than ten steamers and a barge were lost. The steamer KAMLOOPS, carrying a crew of twenty-two foundered with all hands on Lake Superior. Two sailors lost their lives on the steamer LAMBTON wrecked in White Fish bay. During 1926 only three lives were lost on the ten vessels that were wrecked.

Of the six steel freighters that were lost in November and December, five were Canadian, the only American freighter being the E. W. OGLEBAY driven ashore on Lake Superior near Marquette. Other American vessels lost were the steamers UNITED STATES, the carferry PERE MARQUETTE 8 and ALEXANDRA all destroyed by fire. A summary of the names of the vessels lost, the location of the accidents the lives lost and the cargo capacity in tons follows: G. W. PARKER, sand boat, in the St. Clair river; UNITED STATES, passenger boat, Sarnia; PERE MARQUETTE, 8, carferry, Lake Michigan; JOLLY INEZ freighter, 3300 tons, Lake Huron; AGAWA, freighter, 5400 tons, Georgian bay; ALTADOC, freighter, 5600 tons, Lake Superior; LAMBTON, freighter, 3000 tons, White Fish bay; E. W. OGLEBAY, freighter, 5200 tons, Lake Superior; KAMLOOPS, freighter, 3000 tons, Lake Superior, 22 lives lost; ALEXANDRA, passenger, Georgian Bay; barge, Ontario, on Lake Superior.

The greatest financial loss will be on the steamer ALTADOC. The passenger steamer UNITED STATES was insured for $200,000. Besides the total losses listed above insurance will have to cover some considerable wrecking and repair bills. A number of freighters were damaged in the heavy weather on the upper lakes in November.

Sales and Conversions

The steamer FRANK ROCKEFELLER owned by the Pittsburgh Steamship Co. has been sold to the Central Dredging Co., Chicago and will be converted for carrying sand. The same company also sold its steamer JAMES B. NEILSON to J. T. Reid of Port Huron, Mich. This vessel is being fitted for carrying automobiles and will be ready at the opening of navigation.

The WILLIAM F. RAPPRICH of the Tomlinson fleet, Cleveland, will be changed to a self-unloader at the yards of Leatham D. Smith Dock Co. at Sturgeon bay, Wis. during the winter and is to be ready for business at the opening of navigation.

Another vessel the HOOVER & MASON of the Tomlinson fleet will be converted to a self-unloader during the winter at the Lorain yard of the American Ship Building Co. and will be ready for service at the opening of navigation. Still another steamer it is reported of good size may be changed to a self-unloader.

The steamer, CHARLES M. WARNER of the Great Lakes Steamship Co. has been sold to the Great Lakes Dredge & Dock Co. for conversion into a sand boat. The sand and gravel business has been steadily on the increase and many thousands of dollars are being spent in converting old vessels and in building new boats exclusively for this trade. The sand and gravel trade is of large proportion and is constantly growing in volume.

Appointed Professor

Succeeding the late Arthur C. Besselievre, W. S. Owens, who has been assistant naval architect in the maintenance and repair division of the shipping board, has been appointed professor of naval architecture at Webb institute, New York city. Mr. Owens assumed his new duties on Feb. 1. He is a graduate of Webb institute and Glasgow university and has been actively connected with shipbuilding for the past 20 years. He is well acquainted in the industry and of recognized ability, both in theory and practice.

New Plant for Dravo

An eastern shipbuilding and assemblying plant at Wilmington, Del., will be opened by the Dravo Contracting Co., Pittsburgh. The new plant will have a frontage of 878 feet on Christina river. With the new plant in operation this company will be in an excellent position to make seaboard deliveries at New York, Philadelphia and Baltimore with the added advantage of deliveries by way of the intracoastal canal. Approximately 6½ acres will be occupied by the new yard which will be devoted to building steel barges and floating equipment. Ten steel barges for the Arundel Corp., Baltimore, will be built there.

With the launching of the COLORADO in January, the second of two tugs building at the Cleveland yard of the Great Lakes Towing Co., this company's fleet next season will comprise 59 harbor tugs, 3 lighters and the wrecking tug, FAVORITE.

Ocean Carferry Planned

It has been proposed to build several large ocean carferry vessels for service between New Orleans and Havana. The Overseas Railway Co. with Joseph Hodgson former vice president of the Ward line as an executive has been organized to carry this plan into effect. An entire passenger or freight train of many cars will be accommodated on each ferry. No definite date has been set for the opening of the service.

Launch Diesel Tanker

The largest vessel of her type ever built on the Delaware the twin screw, diesel engined tanker MARY ELLEN O'NEILL of the California Petroleum Co. was launched Jan. 21, at the yard of the Sun Shipbuilding & Dry Dock Co., Chester, Pa. She is of flush deck type of 17,000 tons deadweight and an oil carrying capacity in gallons of 6,000,000. Her power plant consists of two Sun-Oxford opposed piston type diesel engines each developing 2500 shaft horsepower.

A Record Stone Cargo

Setting a new high mark in fresh water shipping annals, the CARL D. BRADLEY, largest American Great Lakes steamer brought into Buffington (Indiana) harbor in October last a single cargo of 15,724 tons of limestone, said to be the largest load ever carried on fresh water. Her own automatic unloading machinery discharged the cargo in five hours which is believed to break all records for speed. The limestone came from the Calcite, Mich., quarries, the largest in the world.

This huge new vessel is the latest example of the modern self-unloading type of freighter. Buffington harbor at the Chicago plant of the Universal Cement company is one of the few harbors on the Great Lakes deep enough to accommodate so large a boat. A million-ton storage yard provides ample space for raw materials brought in by water.

Denton Appointed

The nomination by President Coolidge of Albert H. Denton of Kansas as the new member of the shipping board was confirmed by the senate Jan. 4. Mr. Denton after taking the oath of office immediately assumed his new duties occupying the office formerly used by his predecessor W. S. Hill of South Dakota who recently resigned. Commissioner Denton heads the board's bureau of finance.

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Late Decisions in Maritime Law

Legal Tips for Shipowners and Officers

Specially Compiled for Marine Review

By Harry Bowne Skillman

Attorney at Law

RADIO apparatus installed aboard a ship, though subject to a chattel mortgage, is part of the ship's machinery, tackle, apparel, and furniture, it was held in the case of KATHERINE, 15 F. (2d) 387, and, on seizure of the ship in libel, predicated on bottomry bonds and other maritime liens, the mortgagee was not entitled to have such liens subordinated to its mortgage. It was further decided, in the case of AUGUSTA, 15 F. (2d) 727, that, as a ship is considered as consisting of the hull and engine, tackle, apparel, and furniture of all kinds, wireless on a ship formed part of her equipment, regardless of who the actual owner might be, and is subject to lien for collision damages, notwithstanding absence of law requiring its installation.

* * *

MACHINIST employed by contractor in making repairs on a vessel, had the right to assume that proper care would be taken for his protection, and was not required to exercise care to discover extraordinary dangers, it was said in Wallace v. United States, 16 F. (2d) 309; the machinist was only charged with defects known or plainly observable, and appreciated by him under the circumstances.

* * *

IT IS the duty of a shipowner to furnish reasonably safe appliances for the prosecution of work aboard ship; the fact that a longshoreman, whose injury was caused by a defective winch furnished by a vessel, was employed by an independent contractor engaged in loading the vessel, does not relieve the vessel from liability.—O'Connor, Harrison & Co. v. Klingel, 16 F. (2d) 460.

* * *

A VESSEL which goes ahead after receiving a proper signal warning that a drawbridge is not opening takes the risk of consequences which ensue. There is nothing in the statutes or regulations, said the court in Donovan v. New York Central Railroad Co., 16 F (2d) 611, which justifies a vessel which has received a warning to the contrary to proceed upon the assurance that the bridge will open at once in response to a signal, without reference to the safety of approaching trains and other surrounding circumstances. The law does not require railroad traffic over the bridge to be imperiled in order to allow the immediate passage of vessels.

* * *

IN A salvage case the property is valued, not for the purpose of paying its salvor for its partial or total destruction or appropriation, for he never owned any of it, but solely because what it is worth is one of several factors to be considered in fixing his reward. It should not be appraised at more than it is worth to its owner. Ordinarily, that is what he can get for it in the market. If it is not salable, its value will be measured by what it earns for him, or by the value the evidence shows he puts upon the pleasure he gets out of it, not exceeding what it would cost to build another like it. It is unnecessary to reach anything more precise than a rough approximation of the worth of the salved property in the condition in which it was upon the completion of the salvage service. —Rand v. Lockwood, 16 F. (2d) 757.

* * *

ADMIRALTY law casts upon the owner of a vessel sunk in collision a duty to exercise reasonable care and attention to minimize the loss. He is required to make reasonable efforts to ascertain whether the vessel can be saved, and if, as a result of such efforts, he finds that it is reasonably possible to salvage her, and that the expense of raising and restoring would not exceed her value when restored, the owner would not be justified in abandoning the vessel and exacting full compensation for her value.—Boston Sand & Gravel Co. v. United States, 16 F. (2d) 643.

* * *

PERMITTING powder to remain on deck, with knowledge that loose powder was running out of container at time cargo was being discharged in the immediate vicinity, constituted negligence as respected liability for officer's death from explosion. Recovery for the death could be had under the merchant marine act of June 5, 1920, section 33, although death resulted in a hospital to which the seaman was removed.—Clyde Steamship Co., 16 F. (2d) 930.

* * *

CHARTER, by which charterer hired vessels for a specified time at a specified hire, and assumed exclusive possession, command, and navigation of vessels, and employed all persons managing and operating them, made the charterer owner pro hac vice; such owner, it was decided in the case of DUTCHESS, 16 F. (2d) 1003, could not acquire a lien against chartered steamer for damages to a barge owned by it, nor could the owner of the barge, on resuming possession thereof, acquire a lien.

* * *

FACT that the seller of an engine to be installed in a boat reserved title did not defeat a maritime lien for the unpaid price, nor did the seller's agreement in the contract of sale to accept personal notes for the engine amount to a waiver of such lien, especially where the notes were not given.—E 270, 16 F. (2d) 1005.

* * *

THE fact that other repairs were made to a barge did not relieve charterer and towboat company, whose negligence caused the stranding of the barge, of incidental expense made necessary by their negligence. But the party injured was not entitled to make a profit out of the injury, and was therefore not entitled to an allowance for painting the bottom of the barge, not necessitated by the accident or by resulting expense.—Galena Navigation Co. v. Sinclair Navigation Co., 17 F. (2d) 9.

* * *

IF MARITIME liens exist and the party making the advance to pay them off is entitled to be subrogated to them, it makes no difference whether the assignee paid a consideration for their assignment; he has title to the claims and may maintain the action.—VEDAS, 17 F. (2d) 121.

* * *

OFFICERS and agents of a vessel bind the vessel for necessaries, when appointed by the charterer or an owner pro hac vice, unless the furnisher knew, or by the exercise of reasonable diligence could have ascertained, that because of the terms of a charter party, agreement for sale, or for any other reason, the person ordering the necessaries was without authority to bind the vessel.—HAMMOND, 17 F. (2d) 118.

* * *

OWNER of barge, which was sunk just off main channel, had the duty, just as soon as he learned of the wreck, of marking it. Tugs do not share in the duty to mark the wreck, whatever their fault for causing it, and a tug which negligently sinks a vessel is not liable to subsequent craft which may foul the wreck, either for failing to mark it, or because the second collision is a proximate consequence of the first fault. A tugowner is no more responsible for the eventual collision, when he himself suffers from his earlier fault, than when another is the victim.—Red Star Towing & Transportation Co. v. Woodburn, 18 F. (2d) 77.

* * *

NEGLIGENCE in a would-be salvor is perhaps viewed with a benevolent eye; but, when plainly proved, it entails responsibility, as does negligence in the performance of any other assumed or imposed duty. Generally, every salvor is bound to the exercise of ordinary skill and diligence. —CAPE RACE, 18 f. (2d) 79.

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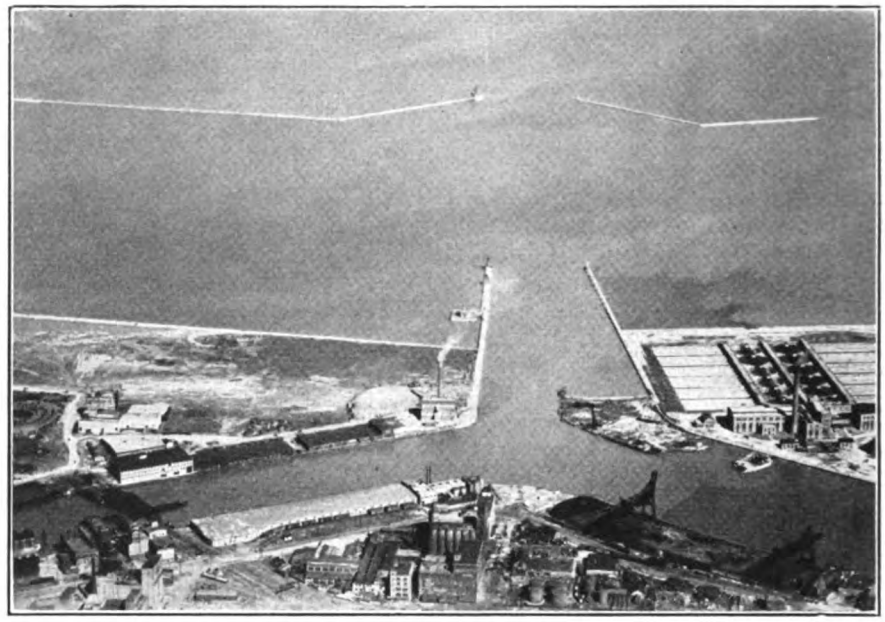
Milwaukee Harbor

(*Continued from Page* 54)

be provided. This will eliminate the necessity of vessels negotiating the tortuous rivers, bridge obstructions and present practice of berthing at two or more docks to discharge and load cargo. The tentative plans call for a pier 300 x 700 feet, two-story warehouse, four depressed tracks down the center of the pier, mechanical handling equipment and trucking space. A portion of the second floor will be allotted for passengers and offices. Adequate trucking space is essential because approximately 50 per cent of the package freight tonnage originates in or is for Milwaukee.

Other facilities under consideration include a cold and dry storage plant, United States bonded warehouse, class three, grain elevator, transit sheds, and a dry dock and ship repair plant.

The development of the outer harbor will extend over a period of years and the facilities will be constructed only as demanded by the trade. Because of the present general trend toward water transportation, greater waterborne commerce, diversified and increasing industrial production, surplus agricultural production with world-wide distribution and the inevitable Great Lakes-St. Lawrence ship channel, Milwaukee is destined to become one of the principal ports at the western end of our Great Lakes system and it is making ready now to be prepared for this eventuality.



Milwaukee Harbor Entrance—Outer Breakwater and Pier Heads

World Shipbuilding Shows Steady Gain

WORLD shipbuilding started the year with a further increase in the volume of merchant tonnage under construction, according to Lloyd's Register of shipping, based on returns from all maritime countries for the quarter ended Dec. 31 last.

The total now reported for the world, 3,118,000 gross tons, is an advance of 44,000 gross tons over the figure at the end of the preceding quarter, which, in turn, showed an advance of 234,000 tons over the June quarter. As compared with the volume of work at the end of December, 1926 quarter, however, the present figures mark a gain of nearly 1,200,000 gross tons, and are not far below the total for the prewar quarter of June 30, 1914, of 3,162,000 tons. The quarterly gains, Lloyd's Register points out, have now been unbroken since September, 1926.

A general comparison between the last two quarters is given in the following table, the figures representing gross tons:

	Dec. 31, '27	Sept. 30, '27
Gt. Brit. & Ireland	1,579,713	1,536,416
United States	97,370	91,070
Other countries	1,441,638	1,446,571
World total	3,118,721	3,074,057

A quarterly review of shipbuilding in the world, and comparisons with the previous quarter and with the year before, issued by James French, chief surveyor for Lloyd's Register of Shipping, New York.

In addition to the gains for Great Britain and Ireland, and the United States, construction increases were reported for Holland, Denmark, Sweden, Russia and Japan. Sweden is now building more tonnage than the United States. Germany shows a decrease of 44,000 gross tons from the figure for the September quarter; Italy, one of 25,000 tons; and France, of 15,000 tons. Great Britain and Ireland, alone, are now building more merchant shipping than all the other maritime countries combined.

No change is shown in the ranking of the leading shipbuilding nations during the quarter ended Dec. 31. Great Britain and Ireland, Germany, Italy, Holland and France retaining their positions in the order named. Sweden, however, which stood eighth in the September quarter, with 82,000 gross tons, is now sixth, with 100,700 tons. As a result, Denmark drops from sixth to seventh place, and the United States from seventh to eighth; with Russia and Japan retain ninth and tenth places.

While merchant steamers and motorships launched throughout the world showed a marked increase during the December quarter over the September one, there was a decrease in the volume of new work begun. The following table, prepared by Lloyd's, shows the comparison in this respect; the figures representing gross tonnage:

	Work begun	Launchings
Gt. Brit. and Ireland	373,932	497,709
Other countries	251,760	325,773
World total	625,692	823,482

In the September quarter, the new work begun in all maritime countries aggregated 760,930 gross tons, as against 526,157 tons of launchings.

A decrease in the construction of tankers of 1000 tons gross and above occurred during the December quarter. This is accounted for by a decline in this class of work in Great Britain and Ireland; the figures for the United States and other maritime countries combined showing a gain. Sweden alone, now has 83,300 gross tons of tank vessels building. The status during the last two quarters is shown in the following table of gross tonnage:

	Dec. 31, '27	Sept. 30, '27
Gt. Brit. and Ireland	339,478	404,592
United States	27,000	22,900
Other countries	378,190	348,140
World total	744,668	775,632

It is noted, however, that the tanker tonnage now being constructed is more than double what it was a year ago, at which time only 371,520 gross tons were building.

Another gain, although not a large one, is shown in the returns of motorship construction. Under the present status, 100,000 gross tons more of

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this type of shipping are being built than of all other types combined. While the December quarter showed an increase of only 20,000 gross tons over the preceding one, the present total of more than 1,600,000 tons is over 700,000 tons greater than the aggregate building a year ago. The comparison in motorship construction between the last two quarters is shown in the following table of gross tonnage:

	Dec. 31, '27	Sept. 30, '27
Gt. Brit. and Ireland....	652,894	653,342
Germany	244,309	239,844
Other countries	712,685	696,324
World total	1,609,888	1,589,510

Further evidence of the increasing use of vessels equipped for motor propulsion is furnished by returns of the power of various types of marine engines being built or installed in all countries. Again the figures for oil engines show a gain over the previous quarter. For the quarter ended Dec. 31, last, the total indicated horsepower of oil engines in hand for marine use was 1,233,956, as against 1,163,630 for the previous quarter. Of the present total, 373,341 is for the shipping in the yards of Great Britain and Ireland, compared with the September figure of 356,440; and 860,615 for the other maritime countries combined, as against 807,190 in the September quarter.

Germany is represented in the present figures with an indicated horsepower of 241,300; and Italy with 161,050. A year ago, the power of all oil engines being built or installed in the world for marine purposes was nearly 400,000 indicated horsepower less than now.

A slight decline is shown in the figure for the indicated horsepower of steam reciprocating engines, in comparison with the September quarter, the December total for all countries being 556,874, as against 568,969 for the previous period. For Great Britain and Ireland, Lloyd's returns shows an increase from 394,224 indicated horsepower to 405,984; but this was offset by a decline from 174,745 to 150,890 for the other countries combined.

There was a gain reported in the figures covering the shaft horsepower of steam turbines being built or installed; the total advancing from 309,900 in the September quarter for all countries, to 343,700 in the December period. The figures exclude Germany, returns for which are not available.

A contrast of present conditions in ship construction with that of a year ago shows that Great Britain and Ireland, Germany, Denmark and Sweden have more than doubled the tonnage in hand at the beginning of 1927. Holland, Russia and Japan show lesser gains; while the United States, Italy and France, are building less than they were a year ago.

The relative position of the various countries is shown in the following table of gross tonnage for the two periods:

	Dec. 31, '27	Dec. 31, '26
Gt. Brit. and Ireland....	1,579,713	760,084
Germany	472,295	211,062
Italy	183,216	239,776
Holland	174,887	145,005
France	115,029	143,068
Sweden	100,700	39,127
Denmark	97,710	41,142
United States	97,370	151,635
Russia	87,658	54,420
Japan	68,870	53,060

Lay-up of Ile de France

ILE DE FRANCE, new flagship of the French line is for the time being laid up undergoing repairs to her machinery. Due to disquieting rumors, tending to hurt the reputation of the new ship and in which there is no truth, the French line has given out a formal statement in connection with her withdrawal temporarily from service. This statement in part is as follows:

The ILE DE FRANCE sailed from New York on Nov. 19 and made a record run to Plymouth and Havre clipping one and one-half hours from her best previous time. Arriving at the port of Havre she maneuvered into her berth and in so doing stripped her two port turbines. This unfortunate circumstance was announced shortly thereafter and the December voyage of the steamer was canceled. After a thorough inspection of the two port turbines it was determined that the extent of the damage could not be repaired in time to permit a sailing from Havre in January. Her January sailings from Havre and New York were then canceled. To be absolutely sure of not booking passengers and disappointing them the February sailings were also canceled and March 7 is the date of the next departure of the ILE DE FRANCE from Havre and March 17 her next sailing from New York. Sailings thereafter will be maintained according to schedule.

The line issued a pamphlet entitled "Two-hundred and Forty Reasons" why it was necessary to cancel the vessel's sailing, referring to the great number of blades stripped from the two port turbines. It is stated that such accidents to these gigantic "watch works" are not uncommon. Furthermore that the turbines of both the new flagship ILE DE FRANCE and DE GRASSE were built in England by the most famous turbine builders and that they are of the best modern type of construction. The repairs involves the renewal of 240,000 blades stripped from the rotors of the two monster turbines. This frank statement of actual conditions should have the effect of ending unwarranted rumors which are untrue and are harmful to the reputation of this magnificient vessel.

American Shipbuilding

In accordance with a statement of the department of commerce American shipyards on Dec. 1, 1927 were building or had contracts to build for private ship owners 215 steel vessels of 163,316 gross tons compared with 188 steel vessels of 212,958 gross tons on Nov. 1, 1927.

There were 61 wood vessels of 30,577 gross tons building or under contract to build for private ship owners during the same period compared with 56 wood vessels of 28,096 gross tons on Nov. 1, 1927.

December Lake Levels

The United States lake survey reports the monthly mean stages of the Great Lakes for the month of December as follows:

Lakes	Feet above mean sea level
Superior	602.39
Michigan-Huron	578.82
St. Clair	574.13
Erie	571.51
Ontario	245.65

Lake Superior is 0.15 foot lower than in November and it was 0.75 foot higher than the December stage of a year ago. Lakes Michigan-Huron were 0.09 foot lower than in November and they were 0.57 foot higher than the December stage of a year ago. Lake Erie was 0.40 foot higher than in November and it was 0.05 foot higher than the December stage of a year ago, 0.02 foot below the average stage of December of the last ten years. Lake Ontario was 0.80 foot higher than in November (since 1860 the December level has averaged 0.09 foot lower than November); and it was 0.23 foot higher than the December stage of a year ago, and 0.45 foot above the average stage of December of the last ten years.

A surplus of $56,897 for October after meeting all charges as compared with a surplus of $3,053 in the same month last year, is reported by the Eastern Steamships line. The first ten months of 1927 show a surplus amounting to $1,699,686 after paying all charges, compared with $809,180 in the same period of 1926.

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Pulverized Coal

(*Continued from Page 34*)

been 'daddying' it all the while along on board to go down and take stack temperatures reading and so forth, the way we were doing. I feel that within a comparatively short time there will be a number of pulverized coal jobs afloat from which this operating data can be reliably obtained. If these jobs are not put in by you people they are going to be put in by other people, I know. The Germans, the Dutch, the British, are going to go ahead with it. I hope that enough pioneer instinct exists in our American ship owners to go ahead with something that has been started. It has only been started; it has not been finished. A fairly good start has been made but there is a lot more to do. I trust that the shipping board can carry on their experimental work by an enlarged program. I have hopes that they will do that but as I have already stated before, the final plant, the plant that is going to be accepted as the standard for cargo carriers, later for passenger boats, possibly, is going to be the plant that is going to be evolved from the number of plants that you gentlemen yourselves have created with your own money. Thank you, gentlemen." (Applause.)

Chairman Bennett then said: "I think Mr. Jefferson is rather modest in what he has told us. I was fortunate enough to be permitted to go to Baltimore when the MERCER had completed her conversion at the ship repairers yard and to come up with the vessel from Baltimore to New York. I look back with a great deal of pride and a great deal of pleasure to the fact that I was one of the "dirty dozen." I wore a "steaming cap" which had two tags on it when I started and my friend, Mr. Jefferson, religiously bit one off at the completion of my watches. Generating steam on board ship with pulverized coal was experimental and it is still experimental, but I will never forget for many years on the Saturday afternoon when we had those boilers firing properly, and I happened to be taking data, CO_2 reading and things like that, and looked around the fireroom to find there was not a soul in the fireroom but myself. Everything was working so nicely that the others had gone to listen to pulverizers pulverizing and to distributors distributing, or else had gone to chat to the engineer.

"I am sorry that Mr. Jefferson does not feel like giving figures on what the coal consumption was on the trip over. Of course, we do not want to force his hand in any way, but I think he could arouse our interest if he would give some comparative results as between the MERCER, a hand-fired coal burner and fuel oil burner. One of the reasons why the MERCER was selected by the shipping board, I understand, is that there are a number of sister vessels, some of which are burning oil and some of them burning coal. Of course the last analysis, the item that will interest the ship owner is the low cost of carrying tons of cargo per mile, so if Mr. Jefferson could give us some comparative results, a percentage, for instance, of what he found on the first trip, it would be interesting. We, as engineers, will know, of course, that a comparison of one trip in terrifically heavy weather as compared with the average of five or six voyages of other ships, needs a little adjusting, but I think we are all competent to do that in our minds.

"Another thing I think Mr. Jefferson could tell us is this: What effect is it going to have on the fireroom personnel. I think one of the most heartbreaking jobs in the world is to shovel coal into a boiler with a ship rolling 36 degrees, especially if the firemen, like Mr. Jefferson, were overcome by seasickness. The stokers on a ship I think are just about the hardest lot of people to get hold of and the hardest lot of people to keep. There are very few experienced, competent stokers today. We have to pick them up off the beach. So our boiler efficiency on a coal-burning ship is generally pretty low. I think Mr. Jefferson could give us something along that line that might be interesting to us."

Mr. Jefferson replied as follows:

"I am going to confess the reason why I am not giving figures, because I have no business to be down here speaking. I have not made an official report or rather the official report is now being typed at my office to Captain Gatewood. I have shown Captain Gatewood a rough draft of that report and I am going to try to pass the buck to him to see if he will answer these questions.

"Regarding personnel, I would like to answer that question. This type of vessel generally has nine firemen, either three or six coal passers, depending upon bunker arrangements. The bunker arrangement on the MERCER is not too good. We have several places where we have to carry coal through watertight doors which are simply openings, 18 inches by 3 feet 6 inches. Mr. Bennett will recall those because he bumped his head several times going through them. I have bumped other parts of my anatomy. It is a mean job to pass coal on.

"On the MERCER we carried three coal passers and three firemen. All six of these men have signed on for the next voyage. The type of men you get in the fireroom generally do

Record Stone and Coal Cargoes—Lakes-1927

The past year was the third largest in bulk cargoes carried on the Great Lakes in the history of transportation on these waters. It was exceeded in the total amount only by the years 1926 *and* 1923. *Though the tonnage of iron ore carried was nearly 7½ million tons less than in the year before the decrease in total tonnage of all bulk commodities was only* 529,307 *tons, due to a large grain movement and new high records for bituminous coal and stone. Navigation opened a full month earlier in* 1927 *than the year before and closed about the same time so that on the whole, vessels were not worked to capacity, thus somewhat reducing the returns to owners.*

Bulk Cargo Movement—1927

Shipments on the Great Lakes for Last Year Compared with Nine Preceding Years

Year	Iron ore Gross tons	Coal net tons	Grain, various kinds net tons	Stone net tons	Total net tons
1927	51,107,136	34,794,291	14,692,536	14,033,876	120,760,195
1926	58,537,855	31,011,544	12,087,816	12,628,244	121,289,502
1925	54,081,298	28,127,359	13,320,346	11,351,948	118,370,707
1924	42,623,572	25,860,515	15,222,787	9,225,624	98,047,327
1923	59,036,704	33,137,028	11,850,446	9,920,422	121,029,004
1922	42,613,726	19,868,925	14,267,020	7,592,137	89,454,848
1921	22,300,726	26,660,652	12,470,405	3,925,705	68,033,575
1920	58,527,226	26,409,710	6,736,348	7,821,980	106,518,531
1919	47,177,395	26,424,068	6,091,703	6,407,285	91,761,238
1918	61,156,732	32,102,022	6,548,680	7,467,776	114,614,018
1917	62,498,901	31,192,613	7,161,716	6,748,801	115,100,399

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not sign on for the next voyage; they are through, they are going to take another job or something of that sort. On the MERCER they all came up and signed on without anybody saying a word to them. They said they liked the job and were going to stick by it. They had been through the experimental voyage, which was a whole lot harder on them than future voyages are going to be.

"I think the man that you will have in the fireroom needs to be of a little higher type than a lot of our firemen that we have. We have three down there. One is a youngster about 20 years old, weighing about 150 pounds. That is not an ideal fireman for a coal-burning, hand-fired job. The other two boys are good huskies; they are the regular typical firemen, short in the legs, strong in the waist and heavy shoulders, the type that you want for heaving coal. I think that these three men carry a considerable amount of weight. I was not particularly impressed with these men when I came down to the ship; they were men who had been sent there from the sea service bureau, ordinary firemen. From the way these fellows took hold of this job they looked like mighty good men. One of the boys, the lightweight one, was a student at Massachusetts Institute of Technology at one time, and decided he wanted to go to sea. The other two boys were boys who had come up from coal passers to firemen's jobs.

"What this really means in the way of personnel is that you are really substituting intelligent supervision of moving equipment rather than brawn that used to be necessary to lay on a slice bar and yank on an ash hoe, and I think that the whole trend in engineering is towards that substitution of intelligent supervision rather than brute force."

Chairman Bennett then said: "I think it is our good fortune to have Captain Gatewood with us, seeing that Mr. Jefferson has passed the buck to Captain Gatewood. Would it be divulging any confidences if you gave us some comparative results?"

Captain Gatewood, manager of maintenance and repair for the shipping board, said: "Mr. Jefferson passed the buck because I asked him to. I think just this: that it would be unfair to the job and unfair to the industry and unfair to the best type of engineering to give you the results and let each one of you make the allowances that have to be made when the number of variables in the problem is as great as it was in the MERCER.

"If you do not quite understand what I mean by that general statement, let me tell you some of the variables. The ship had too short a stack. We are lengthening that stack. By that I mean she had a shorter stack than any sister ship in our fleet. We did not want to spend any more money on the MERCER than we could and we let the stack stay just as it was when she had been laid up several years ago. She did not get the draft that she should have had, the draft that was gotten at the Philadelphia test plan. We overlooked banking off the third boiler that we did not use—providing it with dampers whereby it could have been dampered off if we had wanted to do that. The result was again that she did not get the draft.

"There was a coal fire on board going over. It is very fortunate that it happened, in my judgment, because it did not prove to be unduly serious but it involved the loss of a lot of coal, all of which has to be estimated. The bunkers were not accurately measured until after all these demonstrations that were held here in New York and there is another estimate that has to be made there as to how much coal was used in various demonstrations.

"I would consider the weather on the trip very bad as regards draft conditions, as regards general steaming conditions, that is miles per ton of fuel. The demonstrations over there require an estimate.

"There are a great many elements that have to be estimated. The other principal thing was the mechanical difficulties that were encountered on the trip over and back involving considerable loss of coal that was absolutely unnecessary in a job that did not have those difficulties. While the difficulties were all of such a nature that they could be overcome by the facilities and the energy and ingenuity of the ship's force, they nevertheless materially detracted from the ship's performance as a fuel performer.

"Now, after saying all that, I shall say this: that the performance was materially better than it would have been with hand-fired coal or that any hand-fired coal ship of that type that we know anything about in our fleet would have had. As a result of that, the cost of the fuel was very much less than it would have been in oil. I shall also say that the betterments that we now can see with the hindsight that we have now—there are a number of them; they are all small but they will all contribute to a very much better performance on the next trip. I say that so confidently because the nature of the betterments are plain things that, now that we have encountered them and can see what has to be done or can see where the difficulties come up, you would wonder why we did not see them before. But, anyway, they are purely of a mechanical nature. The fundamentals of the job are absolutely sound. The performance of the vessel in the future can be so materially bettered that it would be unfair to all concerned to give out too accurate figures now and make all of those different allowances.

"Let us simply say that it was materially better. And by 'materially' I mean well above 10 to 15 per cent—we will say well above 10 per cent better than a hand-fired coal job and very much better from a cost point of view than an oil-fired job, but it is going to be considerably better than that when the vessel goes out this next time. I would not figure it a good engineering statement to make any further comment than that on the consumption of the coal.

"I hope that answers about what you had in mind. I hope I am not holding anything back. I think it is better to have at least one more run. We cannot take that first run with all the minor and major griefs of a very difficult voyage. Nobody was following consumption on that voyage. They were trying to get this ship over and get it back on schedule and let the consumption come where it would. It seems to be much more important to produce a reliable unit, deliver a cargo and get back on schedule than to save this or that fuel on the first trip. We know you are going to run up against difficulties when you stop and take a strainer out and put in another, when you have difficulty with bearings, shut down on one side and carry the load on the other side and pick up again on that side and get the two sides in series and so forth. You have quite a problem on your hands and you are going to lose coal and all those things which we think we have practically obviated on this next run.

"While the ship did not stop and she made a schedule, and all that part is very creditable, the actual consumption can be so materially bettered that I think she should be given another trip and let us see what we can do. Anyway, we think so well of it that I am going to recommend six more ships."

Then followed a series of questions and answers:

Chairman Bennett: "Captain Gatewood mentioned a coal fire on board. So that you shall not be under the impression that the fire came from the use of pulverzed coal, perhaps I had better tell you that we—when I I say 'we,' it was the 'dirty dozen' that were really responsible for that

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fire. I understand that after the ship was completed at Baltimore and the coal was all on board, they felt it necessary to weld some clips on to the bunker bulkhead. So they were welded on with acetylene torch, which naturally generated a lot of heat in the vicinity and there was coal on the other side. I think I am right on that, am I not?"

Mr. Jefferson: "Yes, we located very definitely where it started from."

Chairman Bennett: "I give that explanation because so many people have asked whether pulverized coal is not highly dangerous or highly explosive on a ship. I thought perhaps it was well that you should know that the fire was not caused by pulverized coal in any way.

"Probably some of you gentlemen would like to ask Mr. Jefferson some questions. If so, try your luck. I do not know whether he will answer them or not, but I think he will do his best."

Ordinary Bunker Fire

Captain Gatewood: "I might just say the fire was at the very bottom of the bunker, and it took about two days of heavy shoveling to get at it. It was just an ordinary bunker fire and had nothing to do with pulverized coal feature installation. It was a normal bunker fire that occurs in any ship's bunker when a lot of heat is put down there near it. It did not occur until some days after the vessel had gotten out of New York, but it helped us to know what to do and it brought out a problem that helped our installation because those problems will have to be met; there will be other bunker fires in other coal installations. They frequently happen. There was nothing about it that could not be handled by the force on board."

Question: "Mr. Jefferson was describing these firemen and about how they stood the game. I think we get better firemen in oil burners than we do in coal burners. Do you find that three coal passers and three firemen measure up to your requirements?"

Mr. Jefferson: "A coal passer has to have meat to do his work. The firemen ought to be the type of man that the navy would use as watertenders. As far as taking care of operating, you could probably do it with the regular oil burner firemen, but the watertender is a better type of man. There is difference in pay of I think something like ten dollars."

Question: "I would like to ask Mr. Jefferson if there was any accumulation of ash in the boilers after the ship arrived in Rotterdam, enough to cause any lowering of the boiler efficiency."

Mr. Jefferson: "In Rotterdam we did not clean the boilers at all. They came back with all the ash in them that had accumulated there, and we did not clean them until we reached this side. First, I was inclined to think that there was a slight falling off of boiler performance which I attributed to the accumulation of ash in the tubes, and so forth, in the furnace, but I went over and saw them clean the furnaces out and there was only about three inches of slag and coke in the bottom of the furnaces, so that did not explain it. When I got that analysis of the coal today that showed that the biggest percentage of the coal that we burned on the way back was approximately 2000 B.t.u.'s less than that which we used outbound, I decided that that explains the difference in the fuel consumption, so while I do not consider it advisable to attempt a 3500 mile voyage right on top of another one without cleaning the boilers, it was done in this job because we did not have time to clean the boilers out due to demonstrations abroad. My recommendation would be to sweep the tubes at both ends of the voyage and also clean out any accumulation of slag in the furnace. We did take the slag out of the furnace on the other side, which was about three inches, with the exception of the two furnaces. We left it in them purposely to see what would happen on the way back, and instead of being six inches thick when we got back, it was eight. In a total of 7000 miles, eight inches was the accumulation on those two furnaces, but in the other furnaces on 3500 it was about three inches."

Question: "Practically all of the collection was in the furnace?"

Mr. Jefferson: "There was nothing in the combustion chamber."

Question: "You have not any condition there that is much worse than oil."

Furnaces in Good Shape

Mr. Jefferson: "I have seen a lot of oil burners come in with much dirtier furnaces. This accumulation is much harder than what you get in oil. The oil would be a very porous slag. This will run in layers about an inch thick, very hard stuff with a little coke in between and then another inch of very hard stuff that you will have to break just the same as ice."

Question: "Was it found to be a fact that your CO_2 could be maintained practically constant throughout the voyage regardless of weather conditions, providing that all machinery was running without any breakdown?"

Mr. Jefferson: "You would have to adjust your secondary air and your primary air to meet your stack draft. Your stack draft changes. For instance, if you are running with a beam wind, the stack draft would be a whole lot different than if you had a following wind. If you had a head wind, the combustion conditions would be very much better than with the others, although your ship's speed would be retarded."

Question: "You were probably then operating close to 80 boiler efficiency throughout the voyage?"

Mr. Jefferson: "Around that."

Question: "Mr. Jefferson, from your experience gained do you think that on future installations it would be desirable to have an individual pulverizer and distributor for each boiler, or a common distributor such as the MERCER had originally?"

One Mill for All Boilers

Mr. Jefferson: "The installation we had there was all three boilers with one mill. That means that you have a tremendous load on your primary fan. For the sake of economy it is better to have the individual pulverizers, one for each boiler, not only for the sake of economy but if you have all going from one common distributor, your whole works depend upon that distributor, and that is an awful lot of responsibility. It is like a man going around with one button on his suspenders."

Chairman Bennett: "Are there any other questions you desire to ask Mr. Jefferson?"

"Mr. Jefferson, do you feel as a result of the first voyage of the MERCER that a private ship owner would be taking any great chances in starting the installation today on his ship?"

Mr. Jefferson: "It all depends on who does the engineering. You have got to have somebody who is going to sit down and study your problem of installation, somebody who knows what is going in there, and not depend upon the manufacturers to do the whole installation."

Chairman Bennett: "That follows along a warning I made in one of my reports to the Steamship Owners association that they should not be persuaded by the wiles of some of these people who are selling equipment that they will design a complete installation for them. My two years of following the tests at the League Island navy yard and my trip up on the MERCER generated in me a great respect for pulverized coal. It is one of these things that works beautifully

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if it is properly designed from the engineering point of view by people who have had experience in pulverized coal, but God help the man who takes some amateur engineer and lets him play with it. It is simple when it works well and it is terrible when it does not.

"Are there any more questions anyone would like to ask Mr. Jefferson?"

Question: "I would like to ask, could it be worked out with individual units of a furnace like on the stationary furnace?"

Mr. Jefferson: "Let me tell you a little experience of a different line. A few years ago the navy department developed an individual blower burner for oil, and it is a darned good burner. I was filled with enthusiasm. I came around to Captain Gatewood and we spent some real money putting them in. We put them in three ships. We followed them up and got good results. Then we let them drift over to the ordinary operations. Those three ships are not on the honor roll or anywhere near the honor roll. The reason for that is that while you can get the best results possible in that unit control, you can also get the worst results, because you have got to follow up all your air conditions on each individual unit and the thing becomes too complicated for the ordinary operating personnel to follow up day in and day out. That is going to be the answer to the individual mill, I think, on a furnace. It looks like an easy solution. Probably it will work out fine with the right people operating, but you have got to get your whole apparatus simplified so there will be less chance for making mistakes in operation. It may mean that your final product will not be capable of as high efficiency as you can get with the individual unit, but you also will not be capable of making such bad bulls."

Hardness of the Slag

Question: "May I ask one other question, Does that slag in the furnace get so hard that you have to chisel it out, or does it knock out something like a clinker?"

Mr. Jefferson: "It is very similar to ordinary clinker. It does not hold on to the iron. There is always about an inch of coke between the iron and it."

Question: "I think probably Captain Gatewood remembers something on that same subject. He has seen powdered coal burning installations up in Baltimore where they actually save that slag."

Mr. Jefferson: "I have some beautiful stuff up there in my office now that Tiffany could use."

Question: "But you do not have to use the chisel?"

Mr. Jefferson: "You might have to use the chisel to break the surface, but you do not have to chip it off the metal. There is coke underneath that and it does not attack your metal."

Captain Gatewood: "I might say just one thing in following out the evident intent of your question of whether private owners should put money in this thing now. I think they very decidedly should. I would not say that anyone ought to equip a whole fleet now, because I think that is unwise in the present state of the game. We are not going to equip even our whole fleet on this coast right away, but we are not going to get anywhere in the standardization and practice of this thing either in installation or operation until a number of us have an installation or two or three in our various fleets. There is no question at all in my mind that the thing is perfected to a point where a coastwise owner is perfectly justified in the present state of development in converting several boats of his fleet right away. It does not cost a great deal of money. Whatever it costs you get back in a short time.

System Is Practically Perfected

I personally thing the future results on this MERCER are going to be ten or 15 per cent better than we got before. That is the reason I am not giving you this consumption, because I am confident they are going to be so very much better that it is going to be a figure I would not want to give you right today, there is too much prophecy in it and not enough actual practice, but I do not think we are going to get very far in this if the American ship owners are going to hold back and let the shipping board do this thing until it gets down to a fine point. You can certainly make a step today that will cut your coal bill 15 or 20 per cent at least and cut your oil bill in half. You can do that, and if you cannot do it, we will show you how to do it if you come up to my office. We are not going to get anywhere if only one person is going to do it with off-shore boats where some of them do not come back for three or four months. You cannot tell very well what you are doing in that long range; under government handicaps, and so forth, you are not going to get very far. You people can contract, install, and almost get your boat going before we, with the machinery we have to go through, can get an installation.

"I certainly think we can bet the results of the MERCER. I think from what we now know that it would justify putting coal burning installations at sea just as soon as possible.

Question: "You said you thought some steamship companies could go ahead and convert to pulverized coal right away. Supposing a ship we are contemplating converting would be nothing but a coal burner today, no oil installation at all. Your recommendation would go so far as to recommend that that ship be converted, we will say, to pulverized coal burning without any oil features on the ship?"

Raise Steam Pressure Quickly

Captain Gatewood: "I would certainly say so for the coastwise service without any reservations."

Question: "Is the MERCER equipped with soot blowers?"

Mr. Jefferson: "Yes. That is important."

Chairman Bennett: "Any more questions?"

"Mr. Jefferson has mentioned that we were two years ahead of Europe in the burning of pulverized coal. He also mentioned Captain Brandt who has done a lot of experimentation on the other side. Captain Brandt, I think last June or July, read a paper before the Institution of Naval Architects in Great Britain, giving the results of his experimentation. I have a copy of that paper, which shows a scotch boiler and on the front of that scotch boiler they build a beautiful refractory brick Dutch oven, in order to give the necessary length of flame, a makeshift that the efficiency of the Peabody burner made unnecessary. One of the very interesting things about the tests conducted at the League Island navy yard was the fact that they did not take any short cuts to success. It may have taken them longer to get results, but the results as we have them today are very much more satisfactory in every way. To you engineers, a big brick Dutch oven on the front of a furnace is an abomination. When you go on board the MERCER you will find that the front of the boiler is practically the same as an oil burner, so if you are burning pulverized coal and got in some out of the way place where it was necessary to go back to hand firing, why you would not have to tear down two or three brick houses to get to the furnace.

"Another rather interesting thing I noticed on the MERCER is that we seemed to be able to pick up boiler pressure quicker with pulverized coal than with fuel oil. Without casting

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any reflections on the watch which preceded the one Mr. Jefferson and I had, we often found it necessary when we went on watch to pick up steam. It was perfectly amazing the way that boiler pressure went up. I think it was really due to the very high turbulence of the pulverized coal in the furnace, which brought every particle of heat in contact with the water walls of the furnace.

"If there are no further questions, I want to thank Mr. Jefferson for coming here today. This is your third visit, and each one gets more interesting. I do not know any marine installation that has raised as much interest among the steamship people at large as pulverized coal. It appears to have aroused even more interest on the other side than here. Judging from the reports I get from the other side, they are much interested. I suppose it is from the fact that coal means more to them, especially in Great Britain, than it does to us. They have to import all their fuel oil. In fact, they are so interested on the other side in this subject that I know of my own knowledge of two different steamship companies who have sent representatives to this country on flying trips to find out as much as they can about pulverized coal. Unless we get busy and the private ship owners get into this thing, I think we are not going to hold any advantage that we may have at the present time.

"Captain Gatewood, I thank you also for attending. This brings to a close a very interesting meeting. Thank you."

Saturnia is World's Fastest Motor Vessel

THE Cosulich line has announced the sailing from New York on Feb. 25 of its new liner, the SATURNIA. *Like her sister ship the* VULCANIA, *she has a gross tonnage of 24,000, a displacement of 35,500 and a length of 632 feet. Both ships were built in the company's yards at Monfalcone, Italy.*

The profile of the vessel is distinctive, in line with the new trend of motor vessels. The single short stack, the close masts, the gradually ascending superstructure give it an original aspect, which many say represents the approaching type of ship. The diesel engines, the most powerful in the world, are two in number, each of eight cylinders, and they develop over 24,000 horsepower, giving a speed of 22 knots. Auxiliary power brings the total horsepower to over 33,000.

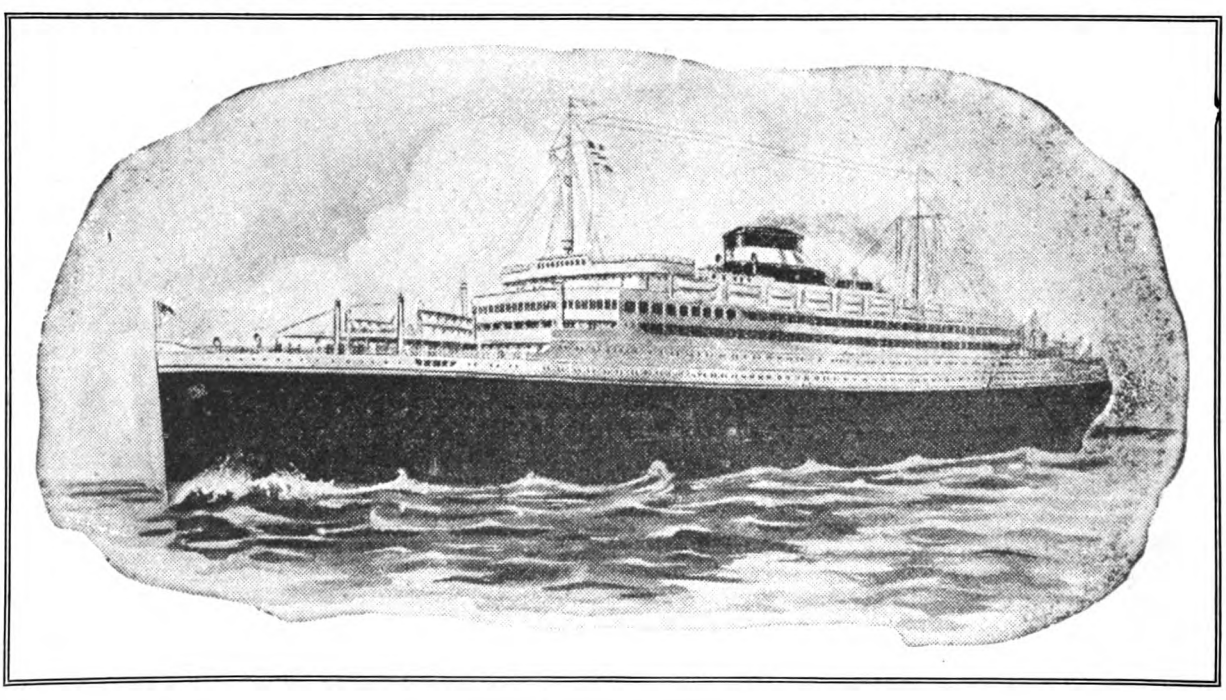
The SATURNIA *is of the latest safety construction, having a double bottom and ten transverse watertight bulkheads. Fireproof compartments also add to the safety of the ship. The nine decks are reached by elevators and staircases, with accommodations for several classes of passengers. The matter of safety has also been considered from the navigating viewpoint, for which the latest electrical devices have been installed.*

This equipment includes a Sperry gyro-compass and gyro-pilot.

The accommodations have been the subject of much care, the first class having apartments up to five rooms, which include the distinct innovation of private verandas overlooking the sea. The public rooms in this class are in period style, from fifteenth century Tuscanian to Louis XIV, and from Chinese to Neo-Greek. The de luxe suites incorporate numerous appurtenances beyond the ordinary. Several well-known decorating firms of the continent have had a hand in turning out this part of the ship; among them being Portoix and Fix of Vienna; Marsh, Jones and Cribb of Leeds; and Copede of Florence.

There is space for the accommodation of 280 first class, 257 second class, 309 intermediate first and second class and 1350 third class passengers. The officers and crew number 441, giving a total complement of 2638.

The second and third classes are subdivided as to rates and the effort has been to make all appointments proportionately as distinctive as those of the first class. The second class dining room is on the same deck as the first and is done in tiling with designs taken from Dalmatian shawls. The cooking appointments are of the most recent type, and five galleys are operated.



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Let Every Marine Engineer Imagine

As you read this page, let's imagine you and a group of the most highly trained, highly respected marine engineers in the world today are assembled under one roof.

You have come together to pool your knowledge, your experience and your requirements, and you are going to determine the specifications for the ideal Diesel Engine lubricant.

Above all others, what requisite would you want?

Undoubtedly, Minimum Carbon Residue, would you not?

Alright, put that down.

Next you would want Purity; and certainly you would want "Oiliness".

You also want Body, Uniformity, Fluidity and Compression Seal.

Now then, let's check them over and see what we get:—

Minimum Carbon Residue

Purity

"Oiliness"

Body

Uniformity

Fluidity

Compression Seal

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For Diesel Engines

has *every one* of these characteristics in a marked degree; and in one particular—its minimum carbon residue—it is absolutely supreme.

And, the reason why TEXACO URSA OIL leaves no detrimental carbon residue is because it is non-blended, highly refined and because it is a *distillate* oil.

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Such demonstration will prove to you why more and more marine engineers are using TEXACO URSA Oil for Diesel Engine lubrication—cleaner burning, surer bearing protection, easier starting, delivery of full power.

Considering all these qualities the price is fair—and more than likely less than what you are paying now.

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British Marine Affairs

(*Continued from Page* 29)

drews & Co. Ltd., one for the Moss line, four motorships and two steamers for the Anglo-Saxon Petroleum Co. Ltd., six steam tankers for the Lago Shipping Co. Ltd., built to the order of Andrew Weir & Co., and vessels for the Hain Steamship Co. Ltd., a small one for the P. and O. Steam Navigation Co., the Vacuum Oil Co. Ltd., the West Hartlepool Steam Navigation Co. Ltd., and for other owners. Harland & Wolff also has constructed the machinery for several vessels.

Building White Star Liner

Among vessels now on the firm's slips or being laid down at Belfast are a 26,000-ton motor-liner for the White Star line, a liner of about 20,000 gross tons for the Union Castle line, four motor passenger vessels for the Nelson line of 15,000 tons each, five shallow draft tankers for the Lago Shipping Co. Ltd., and four vessels for the King line. At the Gowan yard the firm has under construction a motor passenger liner for the Nelson line similar to the four building at Belfast, also one for the Argentine Navigation Co. Ltd., and a number of smaller ships. At Greenock two large cargo steamers are on the slips, one each for the Nourse line and the Hain Steamship Co. Ltd. They also have a considerable program of work in hand at their diesel engine works on the Clyde. The repairing and engineering establishments at Liverpool, London and Southampton are well occupied.

During 1927, Workman, Clark & Co. Ltd, launched vessels aggregating 48,911 tons, including the passenger liner BERMUDA of 19,000 tons, a 9000-ton oil tanker and the PORT FREMANTLE, a cargo and passenger ship of 8000 tons. The BERMUDA has already entered service as a passenger vessel of high speed between New York and the island of Bermuda, after which she is named. The oil tanker CHESAPEAKE, mentioned above, was built to the order of the Anglo-American Oil Co. Ltd. on the Isherwood system of longitudinal framing under Lloyd's special survey, for the carriage of petroleum in bulk. The length is 470 feet between perpendiculars, the breadth is 63 feet 6 inches and the depth 34 feet 9 inches. The discharge of the oil cargo is accomplished by two duplex steam driven pumps, each dealing with 300 tons of heavy oil per hour. The main propelling machinery consists of a set of Workman Clark Sulzer eight-cylinder, single-acting, two-cycle diesel engines, and the boat is fitted with electric hydraulic steering gear and electric refrigerating machinery for cold storage provision rooms. It is expected that the CHESAPEAKE will be ready to take her place in the owner's service early in January.

On the northeast coast, Swan, Hunter & Wigham Richardson have a large tonnage on hand, which includes the floating dock for Singapore. This alone accounts for 52,000 tons. The figures of Armstrong-Whitworth, Palmer Shipbuilding Co., Hawthorn, Leslie, are not yet complete, but they already are well above those of 1926, and these firms will start the new year with a considerable tonnage on their books. On the Wear the figures available show that the 1927 returns will exceed the figures of every year since 1924. At Hartlepool the Central Marine Engine Works built 17 sets of machinery of 55,270 horsepower, as compared with three sets of 9035 horsepower in 1926. The figures for Richardson, Westgarth & Co. were 28,440 horsepower in 1927 and 6102 horsepower in 1926. It should be noted that a notable proportion of the year's activities are due to arrears of orders which accumulated in the course of 1926. At the rate of production now ruling these arrears soon will be dealt with and fresh orders are comparatively few.

Liners for Canadian Pacific

Among vessels over 10,000 tons ordered or launched in the last three months of the year are: the DUCHESS OF ATHOLL, 20,000 tons, launched in November at the Dalmuir yards of William Beardmore & Co. Ltd. for the Canadian Pacific company. For this company there were launched in the space of two months five 10,000-ton first-class cargo liners, the DUCHESS OF ATHOLL, and the PRINCESS ELAINE for the British Columbia coastal service, these vessels aggregating over 72,000 tons. This is stated to be a world's record for the number and tonnage launched in that space of time for a private company. The DUCHESS OF ATHOLL is due to make her maiden voyage from Liverpoool on June 1, 1928, to be followed by her sister ship, the DUCHESS OF BEDFORD, on July 13. Vickers Ltd., Barrow, received an order from the Orient company for a liner which, when completed, will be the largest of its fleet. It will be the largest passenger ship built at the Barrow yards and will provide work for over 20 months for about 1400 men. Late in September, Vickers already had launched a 20,000-ton vessel for the same owners.

Sir W. G. Armstrong, Whitworth & Co. Ltd., launched in November from their Walker shipyard a twin-screw steamer, the BEAVERBRAE, of 10,500 tons carrying capacity, one of the series mentioned for the Canadian Pacific company. Sir James Laing & Sons, Sunderland, launched the motor-tanker BRITISH RENOWN, of about 10,100 tons, for the British Tanker Co. Ltd., London.

Ship Sales Moderately Active

Ship sales have been moderately active and divided between various foreign markets. Arcos Ltd., the Soviet purchasing agency, bought a vessel of about 3000 tons carrying capacity, built in 1914, from the Blue Star line (1920) Ltd. for about £46,500 ($230,000). Belgian buyers bought a twin-screw steamer of 10,340 tons deadweight, built in 1902, for £20,000 ($100,000). Italian owners purchased for £15,000 ($75,000) a steamer built in 1901, of 7235 tons deadweight. Swedish owners bought a 7600-ton liner, 24 years of age, for about £16,000 ($80,000). One steamer built in 1909, of 5350 tons carrying capacity, was bought by stockholm purchasers for about £10,000 ($50,000) and re-sold for £13,000 ($65,000). Owners from Norway, Hamburg and Japan also purchased vessels in the British markets.

Freight rates consistently improved from August until the end of the year. The accompanying chart of index numbers, compiled from *The Statist*, London, shows that freights declined from the earlier part of the year until August, when the lowest point was reached, and then rose in November, approaching the April figure. The November index was 40.30 per cent lower than that for November, 1926, when the highest value on record was reached during the abnormal conditions created by the coal dispute. Good business was done in the River Plate grain market during the last quarter of the year, and chartering and rates were well maintained. The average rate to the United Kingdom was 22 shillings in October, 24 shillings in November and 23 shillings in December. Montreal business was poor throughout; this was disconcerting to owners, at a time of year when the market usually is good. There were little signs of improvement as the year drew to its close.

Australian and Indian trade generally was dull, although more activity was shown in Duran coal toward the middle of December. There was some activity in the Danube and the Black sea about October, but these markets became dull. Ore chartering

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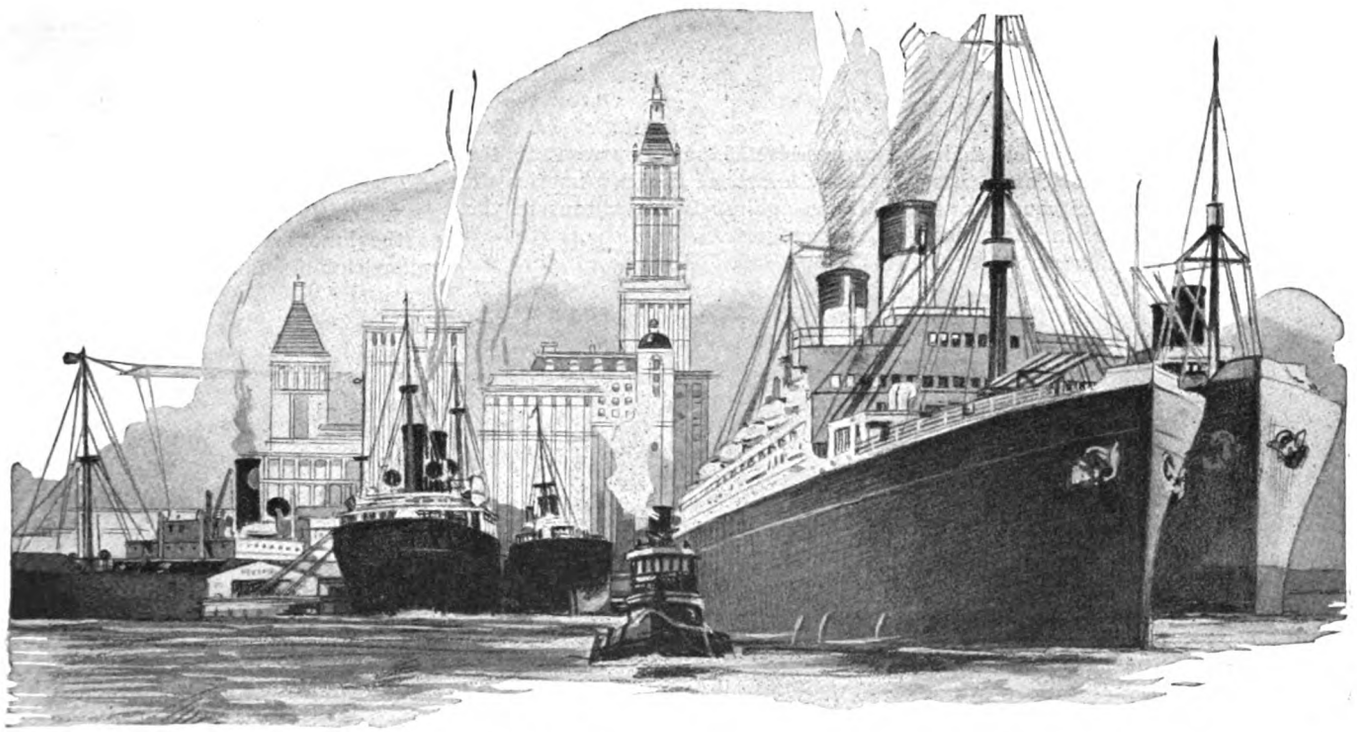


BULL Line Selects Port of Newark

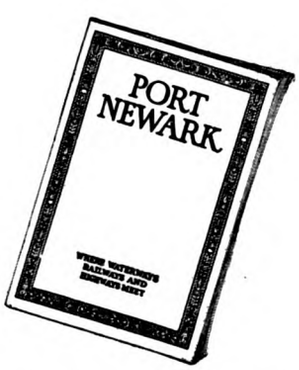
as northern terminus for new Florida line

CONVINCED after extensive investigations that the terminal and distributing facilities offered by the Port of Newark were the most desirable to be found in New York Harbor, the BULL Steamship Line, operating 35 ships in its own service and for the Shipping Board, has selected this Port as the northern terminus of a new line to the Florida coast.

This makes 20 lines now offering regular service from the Port of Newark to Atlantic, Gulf, Pacific Coast and foreign ports.

With the operation of the Holland Tunnel, which brings the Port of Newark within 20 minutes by motor truck of lower New York City, the advantages of this new port at the western end of the Harbor are more obvious than ever. It is rapidly becoming the most important assembling and redistributing point in the whole metropolitan district.

Now is the time to make advantageous arrangements for terminal facilities and warehouse sites. Let us send you the complete facts—the same facts which have already brought the BULL Line and nineteen others to the Port of Newark! Write to



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It contains in brief form, all the facts you would wish to know about the Port of Newark. Every shipping executive should read it. Free on request.

THOS L. RAYMOND, *Mayor*, NEWARK, NEW JERSEY, U.S.A.

PORT NEWARK

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in the Mediterranean was spasmodic, showing some activity in October, comparative dulness in November, and fairly good business in December. The outward coal market showed some life and was fairly well maintained throughout the last three months of the year, although rates were somewhat easier in December, having dropped from about 10s 6d from Wales to the Near East to about 9s 6d. In general, the freight markets at the end of the year showed a tendency toward weakness and the volume of business became disappointing, with the exception of the River Plate grain market, which remained fairly steady.

Employment of Tonnage Increases

Entrances of vessels at British ports, as shown by the Board of Trade figures for the first eleven months of 1927, were less than in the corresponding period of 1926, but well exceeded those of 1925. Clearances considerably exceeded those of 1926 and were about the same as in 1925. In November, 1927, 4505 vessels of 4,998,743 tons entered British ports with cargoes, and 5114 vessels of 5,286,180 tons cleared with cargoes to foreign destinations. In the period ending Nov. 30, a total of 56,133 vessels, trading foreign, aggregating 55,947,089 tons, entered British ports with cargoes. This compares with 58,649 vessels and 58,440,804 tons in the corresponding period of 1926. Of the 1927 tonnage, 22.7 per cent came from the Atlantic coast of North America, as against 26.8 per cent in the corresponding period of 1926. The total clearances from British ports in the period considered during 1927 were 55,699 vessels of 58,578,373 tons, as compared with 38,032 vessels of 42,786,153 tons in 1926. Of these clearances, 17.3 per cent went to the Atlantic coast of North America in 1927, as against 23.4 per cent in the preceding year.

Exports of British coal for the eleven months ended No. 30, 1927, exceeded the figures for 1925. In the period under review the exports were 47,262,788 tons, as against 18,987,802 tons in 1926 and 46,185,067 tons in 1925. Coal shipped for the use of steamers engaged in foreign trade during the same periods was 15,420,224 tons in 1927, 6,891,139 tons in 1926 and 14,991,712 tons in 1925. The total value of exports of British goods, exclusive of bullion and specie, for the first eleven months of 1927 was £763,024,402 ($3,800,000,000), as compared with £716,249,655 ($3,500,000,000) in the corresponding period of 1926 and £847,084,249 ($4,200,000,000) for 1925. As compared with 1926, there was a considerable decrease, about £7,000,000 ($35,000,000), in the value of exports of cotton yarns and manufactures. The increase in the value of coal exports was over £25,000,000 ($125,000,000), and the increase for iron and steel and manufacturers about £12,500,000 ($62,500,000). It is interesting to note that, comparing coal exports for 1927 and 1925, they were larger in tonnage but less in value than in 1925; iron and steel exports were greater, both in volume and in value.

S. S. Dixie Is Inspected

ON JAN. 20, at pier 49, North river, New York the new Southern Pacific passenger steamer, DIXIE was given over to inspection by about 1500 invited guests of the company. These guests included representatives of large industrial concerns interested in shipping, steamship officials, and bankers.

The S. S. DIXIE is an oil burning, turbine reduction geared, passenger and cargo vessel with a speed of 16 knots. She was built at Kearny, N. J. by the Federal Shipbuilding & Dry Dock Co. at a cost of about $2,400,000, and from the designs of A. S. Hebble, superintending engineer of the Southern Pacific Steamship lines. He also was immediately in charge of construction under the general direction of Lewis J. Spence, executive officer of the Southern Pacific Co. Mr. Spence personally supervised the interior arrangement, decoration and furnishings of the vessel.

Her principal dimensions and characteristics are, length overall, 445 feet; beam, 60 feet; displacement, 12,160 tons; load draft, 25 feet 6 inches; gross tonnage, 8100 tons; net tonnage, 5000 deadweight freight capacity, about 6900 tons; cubic freight capacity about 420,000 cubic feet and passenger accommodations for 379. The keel was laid Jan. 31, 1927 and the vessel was launched July 29. Her run will be between New York and New Orleans and she will leave on her maiden voyage from New York Jan. 28. She is in command of Capt. C. P. Maxsom.

Mercury Vapor Boiler for Marine Service

Dr. W. L. R. Emmet, chief consulting engineer of the General Electric Co and famous as the father of electric drive for the American navy greatly entertained his listeners at the luncheon meeting of the Propeller club in the Hotel St. George, Brooklyn, N. Y., Jan. 19, particularly by his references to the wonderful economy possible in the use of mercury vapor boilers in combination with electric drive and how rapidly and very definitely the practical installation of such equipment has come along. For instance, the Sun Oil Co. having conducted a series of experiments with mercury vapor boilers in its refineries, has decided Mr. Emmet said to build a tanker of about 4000 horsepower with power developed by means of mercury vapor boilers. He predicted that such a vessel will run on approximately the same amount of fuel as a diesel drive ship of the same size and that it will be possible for such a ship to use any fuel from coal to crude oil.

For ship propulsion mercury vapor can be supplied as the source of power either through gearing or electricity. Roughly for instance, a vessel like the MAURETANIA could have mercury vapor machinery installed in about one-third of the present machinery space and at about one-half the cost of the steam turbine plant and with a saving of about $800,000 a year in fuel costs. In fact the new method of propulsion according to Mr. Emmet is so much better than the diesel drive that there can be no comparison. A mercury vapor installation giving 70,000 horsepower compared with an equal power diesel installation would show a saving of $350,000 per year on fuel, a reduction of $2,000,000 in machinery costs and a saving of 8000 tons in weight of machinery. Power output and range of temperature are both increased by the use of mercury vapor. The vapor boils at 677 degrees Fahr. while the water boils at 212 degrees. Fuel economy in marine practice he said is a very important item because of continuous operation and the fact that the ship must carry her own fuel.

Mr. Emmet also spoke very interestingly of the new twin screw turbo electric liner, CALIFORNIA. On trial runs the vessel developed a speed of 18 knots with virtually no vibration and despite unfavorable combustion conditions only .80 pound of fuel per shaft horsepower per hour was consumed.

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